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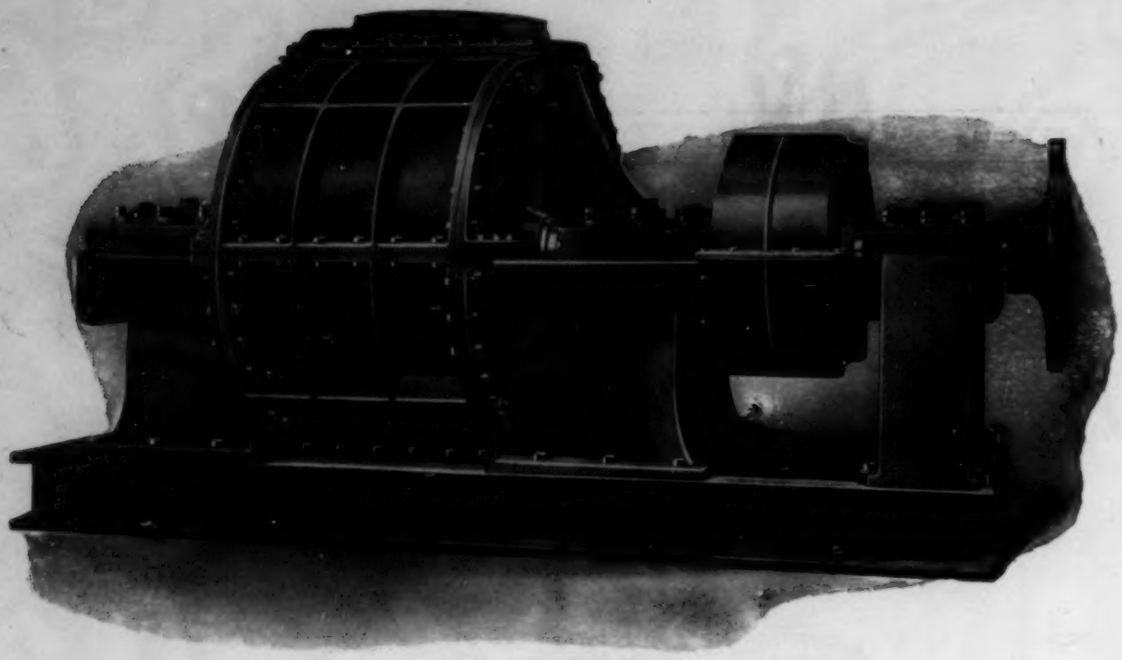
Alphabetical list of Advertisers, pages 168-169. Table of Contents, page 47. "Where-to-Buy," page 116.
Opportunities, pages 161-162. Second-Hand Machinery, pages 163-164-165. Manufacturing Sites, page 166.
Fill-in and Contract Work, pages 166-167. Engineering Directory, pages 152-153.



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THE IRON TRADE REVIEW

Vol. LX Cleveland, March 22, 1917 No. 12

War Stimulus Stirs Steel Markets

Generally Believed Actual War Would Tend to Strengthen Open Market Prices —Belated Preparedness Activities Adding to Mill Congestion— Plates Hold Center of Stage—Pig Iron Strong

WITH the railroad strike already faded from view and traffic conditions everywhere on the mend, interest is converging on the practical effect a "state of war" would have on an already feverish iron and steel market. Although the government certainly will be able to fill its requirements at the "reasonable prices" so ardently sought after by Secretary Daniels, large national orders could hardly have any other effect on the vanishing margin of free tonnage than to stimulate further advances in open market quotations. At the same time, ordinary consumers will be obliged to stand aside while government orders are rushed through the mills.

Government Orders

Plans for the expeditious delivery of steel for war vessels are already being pushed by the navy department. In addition to hurry-up specifications for thousands of tons of ordinary ship steel, the department has just released orders for another large block of armor plate for battle cruisers. A total of 14,820 tons is involved. In various other directions there is evidence that the government is actively proceeding with its belated preparedness program. An inquiry for 7,300 tons of 1 3/64 to 5¼-inch rounds for American shells has been put out by a New England munitions manufacturer. Eastern ship yards are entering the market for large tonnages of fabricated work for plant extensions made necessary by naval contracts. This includes 6,000 tons for crane runways at the Cramp works. The pressure of urgent government requirements also is seen in the price of ship plates which have sold up to 8c, mill, in eastern Pennsylvania. Two Baltimore concerns have received large contracts from the war department for shell forgings and gun stands. Negotiations have been opened by both the Midvale and Bethlehem Steel companies for a number of 48-inch gun lathes, indicating that these concerns have new domestic contracts for heavy ordnance. The Western Cartridge Co. has a government order for 2,000,000 rounds of Springfield rifle cartridges. Other cartridge makers have similar orders.

Plates and Shapes

In finished materials, plates continue to hold the center of the stage. The Bethlehem Steel Co. has distributed upwards of 35,000 tons of ship plates for its Cunard boats. A Pacific coast yard has ordered 4,000 tons for early 1918 delivery, but has been unable to place additional specifications for 4,000 tons more. An Atlantic coast ship builder is inquiring for 12,000 tons of ship steel for the last quarter of next year. A new Japanese plate inquiry for 20,000 tons for 1918 shipment has appeared. Eastern mills are quoting on only one plate inquiry in three. There is an easier tone in shapes in the west and structural demand the country over is appreciably lighter. Fabricating contracts placed during February show the smallest total since September, 1916. The awards amounted to 106,000 tons, or about 59 per cent of shop capacity.

Pig Iron

The pig iron market continues to sweep on and particularly in the east record-breaking prices are the order of the day. At least two makers in Pennsylvania have sold No. 2X foundry iron for last half delivery at $40, furnace. Large eastern buyers are closing for their first half 1918 requirements. Fully 30,000 tons of foundry have been sold in the New York market recently for this delivery. In the Pittsburgh district a prominent furnace interest has sold 5,000 tons of basic at $32.50, valley, and is now asking $33 on about 9,000 tons under negotiation. Chicago furnaces are now quoting $37 for No. 2 foundry. This represents an advance of $2. A Coatesville plate maker has increased its purchases of basic for the last quarter to 58,500 tons. A Cumberland consumer has closed for 4,500 tons of valley basic at $33, furnace. St. Louis melters are prominent in the central western basic market. Sales of southern No. 2 foundry have been made as high as $35, Birmingham, for delivery this year. Other sales, however, are reported at $30, Birmingham, and this price seems more representative of the southern market.

THE OPEN HEARTH

Out Germanizing the Germans

IN THESE critical war days it should be a source of much comfort and gratification to the country at large that its iron and steel industry has been carrying forward the construction of coke plants of the by-product type so vigorously in recent years. By so doing, there has been provided a vast capacity for the production of those coal tar derivatives which furnish the bases for the high explosives essential to modern warfare. The growth of this capacity since the beginning of the European war has been striking. It is estimated by authoritative sources that the country today is producing pure or refined benzol at the annual rate of 30,000,000 gallons; pure toluol from 6,000,000 to 8,000,000 gallons, and phenol from 25,000,000 to 30,000,000 pounds. In the midyear of 1914 our annual production of pure benzol was at the rate of 3,000,000 gallons; of toluol 750,000 gallons, and of phenol 120,000 pounds. The tremendous increase in the recovery of phenol primarily is due to the great demand for this chemical for the manufacture of trinitrophenol or picric acid; the heavy but less marked gain in toluol is attributed to its use in the manufacture of trinitrotoluol. A large proportion of this phenol and toluol under war conditions has been shipped abroad for conversion. In 1916 the country produced about 325,000 tons of sulphate of ammonia equivalent compared with 183,000 tons in 1914. This provides a greatly augmented supply for making nitric acid should the emergency require.

After the war much of the coal tar products now going in some form to European battlefields will be diverted to peaceful purposes. The nation nevertheless through its enlarged capacity for recovering the crudes and agents for high explosives, will have made a vast addition to its military resources and to its industrial preparedness. Furthermore, its manufacturing efficiency will have been greatly promoted by the advantages which the by-product method of coke making possesses over the bee-hive process.

It is a curious prank of fate that the basic principles of coal tar recovery now so widely employed for the industrial and military betterment of the nation have been borrowed from Germany, which has excelled in this line of development.

The Tariff Commission Again

DURING the national campaign last year President Wilson complained that congress had authorized him to select a bi-partisan tariff commission, when he asked for authority to name a non-partisan board.

Apparently the President has struck back at congress. He has named a board that is neither bi-partisan nor non-partisan. With the sole exception of William S. Culbertson, it appears to be an avowed free trade commission. Mr. Culbertson is classed as a Republican by the White House, although Republicans do not accept him as such. But it may be said on behalf of him that, as special counsel for the federal trade commission, he did some particularly good work. His investigation in connection with trade conditions in South America reflected credit upon him.

The board has only one member who by any stretch of the imagination can be said to be known nationally. He is Prof. Frank William Taussig, of Harvard University. His intelligence and integrity may be a saving grace to the commission. Investigation of economic conditions may cause him to see the necessity of the United States adopting a protective tariff as quickly as possible. Excepting Mr. Culbertson and Prof. Taussig, the men named are hardly known outside of their states, or congressional districts. They represent political shades of a nondescript character. The predominating color, if any exists, has a socialistic hue, with all that this implies.

President Wilson has made some remarkably bad appointments since he has been the chief executive of the nation. He outdid himself in selecting the tariff commission. Almost with one stroke he has blasted the high hopes of the right thinking interests of the country that the time had come when the tariff was to be removed from politics and adjusted on a sound and scientific basis. *The Iron Trade Review* has consistently supported the idea of a tariff commission. But it has not advocated and will not approve a board which is shot through with free traders, two of them "lame ducks". The President has taken a distinct step of retrogression instead of progression. It is to be sincerely hoped that the senate will block him before he leads the country into a dangerous economic pitfall.

The State Constabulary

THE labor unions are trying to block the establishment in New Jersey of a state constabulary such as that in Pennsylvania. Their efforts will not succeed if the New Jersey legislature will inform itself fully and fairly concerning the Pennsylvania state police.

The several troops scattered through the state are ready at a moment's notice for strike-riot duty or to hunt criminals. Neutral-minded persons who have seen them in action have nothing but admiring praise for their work. Those who have seen them in strike riots know that they never resort to force until it is absolutely and finally necessary. Greeted by hoots and hisses when they arrive in a trouble zone, they are

THE OPEN HEARTH

frequently cheered when they leave, having won the respect of those with whom they came into contact.

They inspire something more than respect in agitators who resort or incite to violence in their vicinity. Ex-cavalrymen, these mounted policemen are disciplined both by the system under which they work and by themselves individually. They are not the bloodthirsty "hirelings of capital" described by labor agitators. In fact, they are as ready to discipline company guards when necessary as they are to quell disturbances started by strikers.

The mounted police were highly unpopular when they were introduced in Pennsylvania a decade ago. But it scarcely requires figures to show that the decrease of rioting in Pennsylvania has been the despair of agitators. And now the only voices raised against them are those of the same disappointed agitators. They are popular with the masses of workers who have come to know them.

The incidents at Bayonne last year are proof enough that New Jersey needs a state constabulary, and unless the legislators permit themselves to be coerced by threats of what "the labor vote" will do to them when they come up for election again, New Jersey will get a force like Pennsylvania's. And the servants of the people are gradually learning that the so-called labor vote rarely follows the dictates of the self-appointed "labor leader". Labor, which does not like to be driven, very often likes still less to be led.

Topsy-Turvy Prices

WHEN Lewis Carroll wrote "Alice in Wonderland" he made it a topsy-turvy story. Generations have enjoyed the humor of this book. Those who enter the precincts of the steel world at this time with the notions that held place two or three years ago find things as much upside down as did Alice in her adventures the other side of the looking glass. More and more has the situation developed kinks that amaze the steady-going business man who learned to correlate the market in a certain mental schedule and deduce one fact from his knowledge of others.

Inspection of the quotations on steel products shows some surprising things. Finished products seem to be selling for less than the cost of the raw material from which they are made. Wire rods are quoted, as this is written, at $75 to $85 per ton, Pittsburgh. Plain wire, made through many processes from wire rods, is quoted at $3.15 per hundred pounds, $63 per ton, and nails, made from this wire, are quoted at $64 per ton.

Rerolling rails, which have served their time in track, are selling now at $27 to $27.50 per ton and a short time ago reached $31. These rails cost the roads $28 to $30 when new. Plates are selling now at 4.75c per pound and blue annealed sheets, which pass through many processes, are the same price. Plates at 4.75c are $95 per ton, and sheet bars, which in effect are narrow, thick plates, are quoted at $65 per ton.

Steel bars at 3.35c, the present quotation, are $67 per ton, while steel rails sell at $40 per ton and angle bars, which are bars with holes punched in them, sell at 2.25c, or $55 per ton.

Sheet bars are quoted at $65 per ton and tie plates, which undergo much the same process, and are punched for spikes, are only $60 per ton.

Part of the apparent inconsistency is explained by the fact that bars and sheet bars and other partly finished steel that serves as raw material for products of a more finished nature are being bought for delivery months hence at the quotations named. Wire and nails and sheets now being sold will be made from material bought months ago at less than present prices.

However, such advantages of price increases usually are embraced by manufacturers, since they face the probability of an equal loss when the market declines, especially from such dizzy heights. But events have moved too fast in the present instance and price levels are so high that there has been fear that buying might be cut off by too rapid advances. This effect has not been noted except in isolated instances, but it has had a deterring influence. What will happen when things begin to go the other way is any fellow's guess.

Unanimous on Compensation Laws

Recent decisions of the United States Supreme Court supporting the workmen's compensation acts of New York, Iowa and Washington have rendered similar laws in 35 states and territories as solid as the pyramids. That the court's decisions were unanimous, except in the case of Washington, indicates, in spite of some bitter opposition, that these compensation laws are not in the least contrary to the principles of the constitution when they are intelligently formulated. The effect of such action on the part of the Supreme Court should be to strengthen the faith of the working man in our highest tribunal.

A paragraph writer states that the revelations of German espionage in the United States would seem to indicate who put the "fist" in pacifist. Doubtless the "prop" in propaganda came from the same source.

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products March 21, average for February, 1917, average for December, 1916, and average for March, 1916. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Mar. 21, 1917.	Aver. for Feb., 1917.	Aver. for Dec., 1916.	Aver. for Mar., 1916.		Prices Mar. 21, 1917.	Aver. for Feb., 1917.	Aver. for Dec., 1916.	Aver. for Mar., 1916.
Bessemer pig iron, Pittsburgh..	$38.95	$35.95	$35.95	$21.55	Iron bars, Chgo. mill.....	$3.00	$3.00	$2.85	$2.19
Basic pig iron, Pittsburgh.....	33.95	30.95	30.95	19.20	Beams, Chgo. contr.....	3.79	3.38	3.20	2.50
No. 2 Fdy. pig iron, Pittsburgh	37.95	33.95	31.70	19.95	Beams, Pittsburgh, contr.....	3.60	3.25	3.025	2.40
Northern No. 2, Fdy., Chicago.	37.00	31.25	29.25	18.70	Beams, Philadelphia	3.759	3.509	3.409	2.459
Lake Superior Charcoal, Chgo..	38.75	34.50	32.00	19.75	Tank plates, Pbgh., contr.....	4.50	3.75	3.525	2.50
Malleable, Chicago	37.00	30.00	25.00	19.00	Tank plates, Chicago, contract..	4.69	3.94	3.74	2.67
Southern No. 2, Birmingham...	30.00	24.50	22.25	15.00	Tank plates, Philadelphia.....	5.659	5.009	4.409	3.409
Southern Ohio No. 2, Ironton..	35.00	33.00	29.50	18.30	Sheets, blk., No. 28, Pbgh.....	5.25	4.565	4.50	2.75
Basic, eastern Pa.....	35.00	30.50	30.50	20.50	Sheets, blue anl., No. 10, Pbgh.	5.00	4.375	4.00	2.87
No. 2X Virginia, furnace.....	34.00	29.00	23.75	18.00	Sheets, galv., No. 28, Pbgh.....	7.00	6.50	6.25	4.82
No. 2X foundry, Philadelphia...	36.50	32.00	30.25	20.00	Wire nails, Pittsburgh.....	3.20	3.00	3.00	2.38
Ferro mang., delivered.....	275.00	265.00	162.50*	175.00*	Connellsville fur. coke, contr...	7.00	8.00	4.44	2.80
Bessemer billets, Pbgh.....	70.00	62.50	58.75	40.60	Connellsville fdy. coke, contr...	7.00	6.50	6.00	3.90
Bess. sheet bars, Pbgh.....	70.00	62.50	58.75	41.00	Heavy melting steel, Pbgh.....	23.00	21.875	25.00	17.95
Op.-h'th sh. bars, Pbgh.....	70.00	62.50	58.75	41.00	Heavy melting steel, eastern Pa.	24.00	20.50	24.00	17.50
Open-hearth billets, Pbgh.....	70.00	62.50	58.75	40.60	Heavy melting steel, Chgo.....	24.00	21.63	23.37	16.20
Steel bars, Pittsburgh contract..	3.35	3.00	2.925	2.34	No. 1 wrought eastern Pa.....	30.50	27.00	28.00	23.00
Steel bars, Chgo.....	3.54	3.14	3.12	2.50	No. 1 wrought, Chgo.....	26.00	24.00	25.37	16.15
Iron bars, Philadelphia.....	3.559	3.259	3.059	2.259	Rerolling rails, Chgo.....	28.00	25.63	29.50	17.20
Iron bars, Cleveland, local del'y.	3.00	3.00	2.70	2.29	Car wheels, Chgo.....	21.50	18.31	21.90	14.05

*Seaboard.

(For Additional Prices See Page 700.)

Now Buying Pig Iron for Next Year

Large Eastern Interests Actively Contracting for First Half 1918 Requirements—Smaller Consumers Holding Off—Prices Advancing on All Grades in Central West—Southern Iron Strong

Philadelphia, March 19.—Continued heavy buying both for this year and for the first half of 1918 has made $40 foundry and $70 low phosphorus iron actualities in eastern Pennsylvania and is keeping the market stirred and excited. At least two eastern Pennsylvania makers took orders this week for foundry iron for last half delivery at $40, Lehigh valley furnace, or $40.79, Philadelphia basis, for No. 2X. These sales totaled 1,500 to 2,000 tons, and two 500-ton lots were included. These makers are naming $40, furnace, for No. 2X as the present schedule. Fair sales are being made at $39, Philadelphia, and higher. From $37.50 to $38, eastern and central Pennsylvania furnace, appears to be the bottom at present. Little if any eastern Pennsylvania iron is being sold for next year, but there have been various transactions for that period in iron from Virginia, Buffalo and other points. A Trenton buyer is credited with a purchase of 1,000 tons of Buffalo malleable for the first half of 1918. Sales of Virginia iron for next year by the Virginia Iron, Coal & Coke Co. are reported at about 35,000 tons. This maker again has advanced $1 for the first half of next year to $33, furnace, or $35.75, Philadelphia, for No. 2X. Some Virginia sellers are obtaining $36, furnace, and even $36.50 in instances for this year, but occasional sales are going below that figure. Several sales of Alabama No. 2 were closed in this territory the past week at $30, Birmingham, or about $35, delivered. From other districts there are reports of Alabama sales at $31, $32 and even higher, usually for the higher silicons or special analyses. Steelmaking grades again have furnished a large tonnage of sales and inquiry. A Coatesville plate maker has increased to 58,500 tons his purchases of basic for the last quarter. The portion taken in this week was 15,000 to 20,000 tons and largely was eastern iron at $34 to $35, delivered. A Cumberland consumer closed for 4,500 tons of valley basic for last half at about $34.75 or $33, furnace. A Harrisburg user who recently asked for 10,000 tons of this grade has bought some iron. Lebanon low phosphorus iron for last half shipment has been sold at $70, furnace, and $75 is reported. A sale of 2,000 tons was closed at $70, furnace, with an eastern consumer not in this immediate territory. The same user took several thousand tons of standard low phosphorus at $65, eastern Pennsylvania furnace, and another buyer 2,000 tons for last half at the same figure at a second eastern furnace.

Buying for Next Year

New York, March 20.—Large buyers of iron came into the market during the past week for their requirements over the first half of 1918 and some of them have placed round tonnages. The Worthington Pump & Machinery Corporation was a heavy buyer, closing for 20,000 to 25,000 tons of foundry grades for delivery over the first half of next year to its various plants throughout the country. Virginia makers took the bulk of this order and part of it went to Buffalo and Pennsylvania makers. For New England delivery around $35, delivered, or $32.42, Buffalo basis, was paid. This buyer still is in the market for 3,000 to 4,000 tons of No. 2 foundry for Cudahy, Wis.; 600 tons of low silicon for Elm-

(For complete prices see page 700)

wood Place, Ohio; 1,350 tons of charcoal and 825 tons of bessemer, low phosphorus and silicon for different plants. The General Electric Co., after placing about 3,000 tons of foundry for this year, has asked for 10,000 to 12,000 tons of foundry malleable and low phosphorus, for first half of next year. Large eastern malleable buyers, including the prominent Connecticut interests, are in the market for first half of 1918. It is thought 50,000 tons may be bought by these several interests. A New Britain, Conn., consumer placed 2,000 to 3,000 tons of northern foundry for next year, a Bridgeport buyer 1,000 tons with Virginia for this year, an Elizabethport shop 1,000 tons for last half. A Paterson buyer decided not to close on 2,000 tons for this year. A steel foundry in this territory placed about 5,000 tons of low phosphorus with eastern makers. The Utah Copper Co. wants 1,900 tons of foundry for Arthur, Utah. Some of the smaller buyers are more timid in placing next year's orders at ruling prices. Prices are strong at $39 to $40, tidewater, for No. 2X. A 500-ton lot of eastern Pennsylvania iron for last half was sold here at $40, furnace, or $40.79, delivered, this district. For Buffalo iron for next year, $32 to $33 has been done, but some makers now want $34 to $35. Virginia for next year remains at $33, furnace, or $36, Jersey City, for No. 2X. A little more activity in export business is shown. Another 10,000-ton bessemer lot is being closed in the east by buyers for the allies. Italy wants 40,000 tons. Eastern furnaces ask $38, for bessemer. Japan bought 2,000 tons of eastern low phosphorus.

Pig Iron Prices Advance

Pittsburgh, March 20.—With melters of steel-making and foundry irons in all sections of the country calling upon valley producers for rather heavy tonnages, prices are advancing sharply. Bessemer pig iron has been sold at $38, valley, and is being held at $40 by several sellers. Basic pig iron has commanded $33 and is being held at as high as $35, valley. The Commonwealth Steel Co., St. Louis, is credited with having taken more than 10,000 tons of basic in the valleys for future delivery. The Scullin Steel Co., St. Louis, also has been an active buyer of valley basic. Valley iron is being shipped to points in southern Ohio and as far east as Coatesville, Pa.

The Ford Motor Co. and the Dodge Bros., Detroit, have not yet covered their pig iron requirements for the second half of the year. Both concerns likely will buy iron in the Chicago, Toledo, Detroit, Cleveland and valley districts. No. 2 foundry iron is being sold freely at $38, although the $37, valley, price has not disappeared. Malleable iron is as high as foundry iron. Sellers of Virginia irons, for the second time since the opening of books for first half shipments, have advanced prices $1 a ton to $33, furnace, for No. 2X, and $32.75, furnace, for No. 2 plain. A valley blast furnace interest last week sold 5,000 tons of basic iron at $32.50, furnace, and now is asking $35.

Market Report Index

	Page
Pig Iron	656
Ferro-Alloys	658
Wire	658
Bars	659
Semi-Finished Steel	659
Plates	660
Coke By-Products	660
Tungsten	660
Sheets	661
Structural Shapes	662
Merchant Pipe	662
Cast Iron Pipe	662
Scrap	663
Rails, Cars and Track Materials	664
Coke	664
Tin Plate	668
Strip Steel	665
Chain	665
Nuts, Bolts and Rivets	665
Non-Ferrous Markets	668
Machine Tools	692

Heavy 1918 Inquiry

Buffalo, March 20.—Melters are coming into the Buffalo market with particlarly heay and persistent inquiries for foundry and other grades of pig iron for needs beyond the end of this year and well into 1918. There is a decided reluctance on the part of the furnace interests to book orders so far in advance, yet it is reported that some orders in the cases of established customers have been booked for such remote deliveries. The price range is now $39 to $40 with the former holding for the lower grades of foundry irons and the latter the price for the higher silicon grades.

Malleable iron is particularly scarce in this market. Recent sales have been made at $39 for quick delivery and $40 is the present asking price and this is likely to advance as well as the prices quoted now for the other irons.

History Making Prices

Philadelphia, Mar. 20.—Old time pig iron men in this territory have been searching back over their careers to recall a parallel, if possible, for the spectacle this week of eastern Pennsylvania foundry iron selling at $40 at the furnace. Practically without exception, they had never participated in or had witnessed sales of eastern iron above the thirties. Few of them ever had seen it above the thirty dollar line. The previous price record in an experience of 34 years for one of the sellers this week at $40, was $27, eastern Pennsylvania furnace, for No. 1 iron. This was in the days of the big anthracite coal strike.

Sales Are Heavy

Cleveland, March 20.—Pig iron producers who are willing or able to accept business have booked rather large tonnages during the past week. One interest announces that sales during the past few days reached the largest total of any week during the past month. Another interest, however, has definitely refused further business and is concentrating all of its efforts on clearing up the orders now on its books. The supply of iron for sale during the balance of 1917 is small and the comparatively small tonnage available for prompt shipment continues to command top prices. No. 2 foundry is held generally at $38, valley. One sale was made to a northern Ohio consumer at $38.84, delivered, the lot carrying a freight rate of 84 cents. During the past week a number of consumers have entered the market for pig iron for delivery in the first and second quarters of 1918. The Ford motor Co. is understood to be inquiring for a heavy tonnage. No. 2 foundry iron for that delivery is being held at $35 by some producers, and it is freely predicted that half or more of the iron in this district available for first half shipment will be covered within the next 60 days. The threatened railroad strike caused some further delays in shipments, but traffic conditions on the whole are steadily improving.

All Pig Iron Higher

Chicago, March 20.—Foundry and malleable pig iron have been advanced by northern furnaces to $37, Chicago furnace, and sales have been made at that figure. This represents an advance of $2 during the past week. It appears that the present tonnage on furnace books covers the equivalent of third quarter production and there remains unsold less than the tonnage which will be made during the final quarter.

Some important malleable melters have bought only about half their requirements for last half and with the rapidly decreasing available supply it is believed much longer delay on their part may

(For complete prices see page 700)

result in an actual shortage before the end of the year.

Inquiries have been received recently from melters in the east as far distant as Pittsburgh and Toledo. As far as can be learned no sales have been made on these inquiries but they indicate difficulty in placing orders in their own territory. An eastern buyer with several plants, one located in the west, has inquired for about 30,000 tons, including charcoal and foundry irons. This market probably will be called on for 4,000 to 5,000 tons.

It is difficult to obtain southern iron and in most instances furnaces require submission of all orders before they are confirmed. The market appears to be firm at $30, Birmingham, although some resale iron may be available at slightly less. On 1918 delivery, there has been some indication of lower prices but not much iron for this delivery has been sold.

Lake Superior charcoal is quoted at $38.75 to $40.25, delivered Chicago, the lower quotation applying to No. 1 to 5 and the maximum to No. 6 and Scotch grades.

Activity in Basic

Cincinnati, March 19.—It is the opinion in the market here that the Andrews Steel Co., Newport, Ky., has closed for from 15,000 to 20,000 tons of basic iron for the last half and the first quarter of 1918. It is thought that this business went to a southern Ohio stack. No quotations have been out on southern Ohio basic for a long time as all makers are out of the market, but it generally is considered to be held around $35, Ironton basis, for the last half. Producers are also out of the market for either southern or southern Ohio foundry iron for any delivery over 1917. Small lots, however, are being closed without general inquiry around $35, Ironton basis, for southern Ohio No. 2 foundry for the last half, and $30, Birmingham basis, for southern No. 2 foundry for the last half, and $30 to $32, Birmingham basis, for the second quarter of this year. No quotations are available on Southern Ohio silvery iron.

Quiet in St. Louis

St. Louis, March 19.—The market continues quiet and uneventful, due to a lack of iron in stock and inability of dealers to get any. The southern foundries are well sold up, and railroad congestion and car shortages are playing havoc with the trade. Consumers are not getting more than 60 per cent on contracts. Speculative stocks have been exhausted. No. 2 southern foundry pig iron is quoted at $30.40 to $33.40, this range, however, being a nominal one.

Higher Than a Kite

Birmingham, Ala., March 20.—Quotations on pig iron in the south rose to $30 per ton for No. 2 foundry during the past week. Inquiries are numerous for last half delivery. Some sales for 1918 delivery, at a price but one dollar under the open market quotations, or at $29 per ton, No. 2 foundry, are noted. Melt in the home territory, at cast iron pipe plants and other industries, continues heavy. The Matthews Iron & Mining Co. will be making iron at Rome, Ga., within the next 30 days. The Gulf States Steel Co. will shortly be making iron at the little Eagle furnace at Attalla, Ala.

Ferro Alloys More Active

Buyers of Spot and Early Ferro Manganese Now Paying $300—New Spiegel Business is Lighter

New York, March 20.—Spot and early ferro-manganese has developed a stronger tendency and buyers who have held off from accepting quotations of $300, delivered, now are paying that price for single or several carload quantities. A sale of 100 tons of spot domestic was made during the week at $300, delivered. On a single carload, $350, delivered, was quoted. Makers in the Chicago district, who have been quoting from $300, delivered by July, $275 for third quarter, and $250 for fourth quarter, have withdrawn all prices. These interests have quoted $350, delivered, for spot. An eastern maker is reported to be out of the market for all deliveries except the last quarter. English makers have reaffirmed their position of not being interested in any further bookings for the last half at $185, seaboard. Their price of $185, seaboard, remains nominal. New sales in ferro-manganese have been lighter.

In spiegeleisen, a Cleveland steel maker has closed for 2,200 tons for shipment over the remainder of the year. This business is understood to have been placed at varying prices, depending on the delivery, the last quarter going at the lowest figure. Some sellers quoted $74.50 to $75, delivered, for the earlier months. For last quarter, there still are sellers around $60, but for shipment prior to Oct. 1, $75, furnace, or more, is asked. This figure is being shaded where freight rates require, to meet competition. New business in spiegeleisen also is lighter.

An inquiry for 3,000 tons of 11 per cent bessemer ferro-silicon and 3,000 tons of 11 per cent semi-bessemer ferro-silicon for delivery this year, has been issued by a leading eastern Pennsylvania steel maker. It is questioned whether this tonnage can be obtained from makers already crowded with orders. Fifty per cent ferro-silicon continues very scarce.

Manganese Ore Scarce

Philadelphia, March 20.—Manganese ore for early delivery is scarce because of transportation difficulties, and there is talk that buyers will pay much higher prices. There are no new transactions in sizeable tonnages, however. As previously noted, offers of 85 cents, tidewater, have been made for Brazilian ore for April shipment, and of 80 cents for last half. In a negotiation that was under way this week, one seller suggested 90 cents per unit, as a figure to work upon for spot ore.

Alloys Advance Sharply

Pittsburgh, March 20.—Active demand exists for all kinds of ferro-alloys and steel-making metals. A Cleveland steel works, which originally inquired for 2,200 tons of spiegeleisen, has closed at about prevailing prices. Domestic 80 per cent ferro-manganese has been sold in lots of 150 tons at above $300, furnace. An eastern steel manufacturer has purchased about 6,000 tons of 11 per cent bessemer ferro-silicon at what is reported to be $50 or $51, furnace. That grade now is being held at $56, furnace, and above, by leading sellers. Previously prevailing differentials in price quoted by sellers of lower grades of this material have disappeared. Pending inquiries for ferro-silicon for delivery in the second half of this year and the first half of 1918 involve fully 25,000 tons.

Wire Market is Active

Pittsburgh, March 20.—The approach of spring has tended to increase demand for wire products. Jobbers in all sections of the country are specifying briskly in an effort to meet the demands of their trade. Mill and jobbers' stocks are described as low. Wiremakers in this district have experienced no difficulty in selling material on the basis of $3.20 a keg for nails. Rather heavy tonnages of barbed wire and nails are involved in pending inquiries for shipment to England, France, Russia and South American countries.

(*For complete prices see page 700*)

Bar Buyers Wary

New Business is Light in East and West—Government Inquiry

Philadelphia, March 19.—An inquiry for 7,300 tons of rounds ranging from 1-33/64 to 5¼ inches in diameter for projectiles for the United States government has been put before makers here in behalf of a New England munition maker. Delivery is wanted over the last half of 1917 and the first half of 1918. A prominent independent maker of steel bars who recently advanced to 3.75c, Pittsburgh, has made various miscellaneous sales at that figure for delivery during the next several months. Other independent makers are asking 3.50c, Pittsburgh, but the Steel Corporation price of 3.35c, Pittsburg, is being met where the occasion requires it. New business in bars is light.

Bar Market Not Excited

Pittsburgh, March 20.—With more important consumers of bar mill products under cover for the remainder of the year, the market naturally is quiet. Specifications against contracts are described as heavy, but new orders are light. Bar steel is being held at 3.35c for future shipment; none of the mills in this district appear to be in a position to meet specifications for prompt delivery. Bar iron is being held at 3.50c by several manufacturers, although the 3.25c price has not disappeared.

Strike Threat Had No Effect

Buffalo, March 20.—With the mills asking 3.35c base for steel bars, inquiries continue to come in at a rate far in excess of the business being accepted. Consumers are seeking to get their tonnages under contract for advanced deliveries. This situation seemed to vary but little through the period of waiting for the outcome of the threatened general railroad strike and in the face of the embargoes being established by many of the trunk lines.

Heavy Bar Inquiry

Cleveland, March 20.—While inquiries for iron and steel bars continue heavy, some prospective consumers have apparently given up hope of securing bars for early delivery and are no longer asking the mills for additional tonnages. Some agricultural implement manufacturers have not yet covered, in fact, most bar consumers have been able to secure only portions of the tonnages desired. Some mills for many weeks have been following the policy of assuring the customers only the average weekly tonnage which they have been securing for the past year with the result that many consumers were willing to withdraw their inquiries when they found that deliveries on their present contracts would run along for months to come. The market is firm and occasional offers at 3.50c and 3.75c have been made by several independent mills. One local interest reports that the past week brought out the heaviest volume of new orders that had appeared during the past year.

Steel Bars Strong

Chicago, March 20.—Since the advance in soft steel bars to 3.54c, Chicago mill, no decrease in demand has been noted, and buyers are still anxious to place their orders. Some large makers find their new bookings running about equal to shipments, so that no gain is being made in reducing unfilled orders.

Bar Iron Strong

Chicago, March 20.—Bar iron mills have on their books more tonnage for future delivery than has been the case in many months. Usually bar iron is sold for short periods, but under present circumstances, contracts have been made much further into the future than usual. Practically all makers have their production sold entirely through second quarter and some have comparatively little tonnage left through third quarter. They are willing to make contracts at present prices covering the remainder of 1917.

While some buyers probably could cover their requirements at 3c, Chicago mill, 3.10c is also current, and business is being taken at that price. It had been expected that the minimum quotation would disappear shortly as demand is excellent and the market is unusually strong.

Shafting Advance Established

Pittsburgh, March 20.—Manufacturers of cold rolled steel shafting are experiencing no difficulty in selling material on the basis of 5 per cent off the list for delivery in the second quarter of the year. Occasionally, reports of sales at 10 per cent off the list are heard, but indications are that prices below 5 per cent off the list will disappear shortly. Demand for shafting and screw stock is heavy. Manufacturers of material for the United States government have been active factors in the market for shafting since about Feb. 3, when diplomatic relations with Germany were broken.

Hoops and Bands Active

Pittsburgh, March 20.—Mills rolling hoops and bands in the Pittsburgh district are quoting only upon application, having practically no more tonnage available for delivery before autumn. Premium prices are being offered for shipment before July 1. Some makers have withdrawn from the market entirely for the remainder of the year.

(*For complete prices see page* 700)

Turn Down Billets

Refuse to Quote on Export Order—Wire Rods Sell Up to $100

Philadelphia, March 19.—One eastern Pennsylvania maker declined to make quotations on 20,000 to 25,000 tons of new inquiry for billets for export which came before him this week. Eastern makers continue practically out of the market on semi-finished steel. One of them quoted $65, mill, however, on 1,000 tons of open hearth rerolling billets for the last quarter. A sale of several hundred tons of off quality forging billets was made at $80, eastern mill, and another for export of 500 tons of 7-inch rerollers of below standard analysis at $60, seaboard. Standard forging billets are from $90 to $100, eastern mill. Wire rods for export were quoted this week at $90, tidewater. Quotations on rods cover a wide range, depending on analysis. In cases the material is bringing $100, mill, or more.

Semi-Finished Holds Its Own

Pittsburgh, March 20.—Although demand for semi-finished steel products is not so heavy as it was a few weeks ago, yet prices are being held firmly all along the line. Billets and sheet bars are commanding $70, mill, and above. Consumers have purchased virtually all the material available for delivery before July 1, next. Wire rods are commanding from $75 to $85, Pittsburgh. They are described as extremely scarce. Muck bar nominally is listed at $50, Pittsburgh.

Can't Get Sheet Bars

Youngstown, O., March 20.—It is waste of time to inquire in the Mahoning valley market for sheet bars unless you are an old and regular customer of one of the producers. No open market quotations are available, and it is idle under present conditions in this territory arbitrarily to fix even a nominal quotation.

Production is holding up fairly well, and probably is from 85 to 90 per cent of capacity. Shipments of raw materials are a little better than they were some weeks ago, but the rate of progress does not inspire enthusiasm. Outgoing shipments to customers have not improved appreciably in the week past, even for short distances up the valley.

Plate Orders Overwhelming

Eastern Mills Quote on Only One Inquiry Out of Three—Sales of Ship Material at 8.00c, Mill

Philadelphia, March 19.—A new high mark on ship plates, Lloyds specifications, was set within the week when several hundred tons for the last quarter were sold at 8c, mill, by an eastern Pennsylvania maker. This represents a premium of $20 a ton over the regular quotation for ship plates of this producer. On 7,000 tons for Spain 7.50c, mill, has been quoted. Ship plate quotations among eastern mills rule from 7c to 7.50c, mill, or Pittsburgh, depending on the destination, and ordinary tank plates from 5.50c to 6c, Pittsburgh, or 5.659c to 6.159c, Philadelphia. The overwhelming demand for plates, especially for ship construction, is holding up without the slightest diminution. Thousands upon thousands of tons are being turned back without quotations. Only the more attractive inquiries are bid for. Eastern makers declare that their quotations today average about one out of three inquiries. The Bethlehem Steel Co., which recently inquired for 30,000 to 35,000 tons of ship plates, principally for its Cunard line contracts, has distributed this business. A Pacific coast yard placed 4,000 tons for the first half of 1918 at prevailing prices and immediately asked for 4,000 tons more, which was rejected by the seller at any price. One domestic sale of 10,000 tons for delivery through the first quarter of 1918 was made at 6c, Pittsburgh, by the acceptance of an old quotation. Steel Corporation mills recently accepted 5,000 tons of ship plates and 2,000 tons of angles for quick delivery to a Canadian yard. An Atlantic coast builder has inquired for 12,000 tons, covering four ships, and the steel is wanted for the third quarter of 1918. A new Japanese inquiry calls for 20,000 tons. These buyers are seeking first quarter of next year and if that is not obtainable, practically any position in 1918. New demands for car steel are out, including 4,000 tons for the first quarter of 1918. One eastern maker reports having closed some thousands of tons in ordinary tank plates at 6c, Pittsburgh, for delivery as soon as possible.

Plate Price Climbs Upward

Pittsburgh, March 20.—Manufacturers of steel plates in a position to meet specifications for delivery within 30 or 60 days are selling material at as high as 5.50c to domestic manufacturers of tanks and boilers. Ship plates for rather prompt delivery are commanding as high as 7.50c, Pittsburgh. Demand for ship and tank material is exceedingly heavy. For delivery at the convenience of the mill, the Carnegie Steel Co. continues to quote plates at 4.50c. Scarcely any demand exists for car material. The advances in wages to railroad trainmen likely will lead to the adoption of even more conservative policies by purchasing agents of railroads in all sections of the country.

Many Want Plates

Cleveland, March 20.—The huge, unsatisfied demand for plates continues to be reflected in the heavy volume of inquiries being received in this district. Most of the mills are so far behind in deliveries that they are reluctant to accept orders, one interest pointing out that it had not taken a plate order for nearly five months. Despite this fact, this mill is still sold up on plates for months to come. Prices are extremely firm. Shipments of plates from warehouse are being made freely.

Still Seek Plates

Chicago, March 20.—Although the quotation on steel plates has been increased to 4.50c, Chicago, demand for this material is not slackening. Premiums considerably higher than this figure are offered for reasonable delivery, but buyers find it difficult to place further tonnage with mills.

Tungsten Market Quieter

New York, March 19.—The market on tungsten concentrates is not as active as a week or two ago, but there is a fair volume of business moving. Foreign buying has fallen off considerably due to the tendency to buy direct from South America and it is reported that several good-sized tonnages have been purchased in Peru, Boliva and the Argentine, for shipment to Europe. The result, of course, is a curtailment in shipments of South American concentrates to this country, but owing to the decrease in the foreign demand here, the effect on the statistical position of tungsten concentrates in this market is unchanged.

While the foreign demand for concentrates is decreasing in this market, the foreign demand for ferro-tungsten is increasing. There are inquiries from Russia, England, France and Italy which in the aggregate involve in excess of 200 tons of ferro-tungsten and crushed ferro-tungsten, 75 to 80 per cent material being wanted in most cases. It is expected that at least a portion of this business will be closed at around $1.90 per pound, which is somewhat higher than material of similar quality has been sold at for export in the past few weeks. It is considered as doubtful that the Russian and English business will be placed at this time, but earlier action is expected on the Italian and French inquiries.

Benzol is Strong

Due to Car Shortage—Ammonium Sulphate Also Firm

New York, March 20.—Various circumstances such as limited supplies of product, an inadequate number of tank cars and general transportation difficulties are strengthening the pure benzol market. The shortage of tank cars is an important one since most of the business is of this class. Current prices are quotably unchanged at from 55 to 60 cents per gallon but the general average of going transactions is higher. Premiums continue to be paid where supplies and cars are available near destination. New business is of fair volume. Some export buying of toluol has reappeared. Fair sized orders for quick shipment were closed this week. A canvass among producers shows unsold supplies are at small amount. The new foreign business will wipe out much of their previous accumulations.

Some talk of new contracts is current. Prices continue at $1.75 to $2 per gallon for spot and from $1.50 to $1.75 for contract. A better undertone has developed in phenol due to some reduction in offerings. A figure of 45 cents per pound still is being shaded. There is not much new buying. Solvent naphtha remains weak owing to heavy stocks. The accumulation is being reduced gradually by new sales but still is extensive. Prices vary considerably.

Sulphate of ammonia for spot delivery still is advancing sharply as only carload lots can be obtained before July. Prices now are quoted from $4.50 to $4.75 per 100 pounds at tidewater. The strength of the market has been increased by the cutting down of production due to the inferior and low volatile coals which the coke works have been obliged to use during the recent traffic difficulties. Additional prices are to be found on page 700.

(*For complete prices see page* 700)

Sheets Lie in Warehouses

Outbound Shipments Are Slow in Youngstown District—Pittsburgh Thinks Prices Are Abnormally High

Youngstown, O., March 20.—Several million dollars worth of sheets are held up in stock and shipping rooms of mills in the valley awaiting sufficient cars to move them to the four corners of the earth.

While in recent weeks there has been improvement in traffic conditions, it has not been rapid enough as to outgoing shipments. Shipments into the plants of fuel, raw materials and chemicals have improved, so that production is on a better basis. The ever hopeful manufacturers of the Mahoning valley are making the best of things, and expect, with continuance of spring weather, that delayed stocks will be cut down.

Prices of all grades of bessemer sheets continue to harden, but quotations are substantially as they were last week. Black material can scarcely be bought for less than 5.50c, and the range is up to 5.85c, and as high as 6c for special specifications; blue annealed is quoted at 5c, and by one mill at 5.25c; galvanized cannot be bought at less than 7c, according to current quotations, and as high as 7.50c is asked for some specifications.

The demand, from all parts of the United States and from most foreign countries, is as insistent as it has been for months. Practically every foreign country except the Germanic allies, is inquiring for various grades. All classes of sheets seem to be in nearly equal demand. Among the large inquiries at present in the valley is one for 5,000 tons of black material for domestic consumption, which is yet unfilled.

Two mills continue out of the market; the others are taking only such business as looks especially good. The demand for clever note-writing is not as strong now as it was, but when the market picks up, a lot of likely candidates can be found among the sales managers of this district, whose business now is not so much to sell as to keep from selling.

Production of coated material continues to show improvement. Fairly close to half of the pots in the valley now are being worked. Shipments of spelter and sulphuric acid to the plants are better. Two more pots are expected to be in use by the end of the week.

Mills up the valley continue to have trouble getting bars shipped to their plants from nearby Youngstown. Sometimes it takes several weeks to get a car through over a half-hour run.

The recent 18 per cent wage increase in the sheet mills is having no immediate effect on prices already high. Most of the manufacturers are disposed for the present to allow the admittedly wide profit margin of an abnormally high market take care of the wage increase. But they point to the steadily rising cost of semi-finished material, together with the generally increased cost of conversion, as factors tending to force prices upward in the future.

Sheet Prices Higher

Pittsburgh, March 20.—Virtually all manufacturers of steel sheets in western Pennsylvania, eastern Ohio and WestVirginia have no additional tonnage available for delivery before July 1. Books for shipment after that date will be opened about April 1. It is likely that consumers will be able to shade prevailing quotations, which are regarded as somewhat extreme. No large tonnages of material have been sold in the open market recently, and this accounts for the extremely high prices developed by recent sales. Black sheets are selling at a range from 5.25c to 6c, base; galvanized, from 6.75c to 7.50c, base, and blue annealed products, from 4.75c to 5.25c, base.

Heavy tonnages of electrical sheets are being shipped to Europe, South America and the far east. Premium prices frequently are being paid by foreign manufacturers of electrical equipment. Manufacturers of automobiles, electrical equipment and agricultural machinery in this country are specifying briskly.

Looking for 5½-Cent Sheets

Philadelphia, March 19.—Some of the largest and keenest buyers have shown no hesitancy in closing with eastern Pennsylvania makers for good-sized tonnages of blue annealed sheets for third quarter delivery at 5c, Pittsburgh, or 5.159c, Philadelphia, for No. 10 gage. The leading eastern producer now quotes that figure as minimum and is naming 5.25c, Pittsburgh, in some cases. The outlook strongly suggests 5.50c, Pittsburgh, quotations soon.

The Gilbert & Barker Mfg. Co., Springfield, Mass., has elected the following officers and directors: R. H. McNall, New York, president; C. C. Ramsdell, Springfield, vice president; W. T. Rayner, Springfield, treasurer; W. H. Wood, Springfield, assistant treasurer and clerk; A. C. Bedford, F. D. Asche and R. H. McNall, all of New York City, and C. C. Ramsdell and W. T. Rayner, both of Springfield, directors.

James H. Hoyt

Dies at St. Augustine, Fla., After a Short Illness.

James Humphrey Hoyt, senior partner in the law firm of Hoyt, Dustin, Kelly, McKeehan & Andrews, Cleveland, died Wednesday morning at St. Augustine, Fla., after a short illness. Mr. Hoyt was nationally prominent in steel, railroad and shipping affairs, having been a director of the Cleveland-Cliffs Iron Co., a trustee of the Carnegie Pension Fund, second vice president, director and general counsel for the Hocking Valley Railroad Co., secretary and director of the Lake Superior & Ishpeming railway, secretary and director of the Pittsburgh Steamship Co., Provident Steamship Co., Standard Steamship Co., and Peavey Steamship Co., general counsel and director of the American Ship Building Co., and director of several banks and trust companies. He was a member of many clubs and organizations, including the American Iron & Steel Steel Institute. He was born in Cleveland, Nov. 10, 1852, educated in the public schools of Cleveland, and graduated from Brown University and the Harvard University Law School.

New Stone Crusher

The Bethlehem Steel Co. is building a new flux crushing plant which will cost from $300,000 to $350,000, at its stone properties at McAfee, N. J. The new plant will consist of an electric power unit, crushing and screening equipment, locomotives, steel dump cars, shovels, etc. The installation of electric shovels to load the stone blasted down is being considered. At present the stone is broken by hand and is loaded into cars from carts drawn by horses. The new plant will have a rated capacity of 3,500 tons per 10-hour day. All the blast furnace and open hearth flux required at the South Bethlehem plant of the Bethlehem Steel Co. will be supplied by the new crusher. The stone of the McAfee quarry is high grade calcite, especially suitable for blast furnace and open hearth consumption.

(For complete prices see page 700)

Shapes Quoted Four Cents

One Eastern Producer Advances Prices on Small Lots to $80 a Ton—Less Activity in West

Philadelphia, March 19.—Distribution by the government with private yards of awards for battle and scout cruisers is expected to bring about the release of some important tonnages of fabricated work for extensions of Atlantic coast ship plants where these contracts will be executed. The Cramp plant in this city, it is believed, will proceed with 5,000 to 6,000 tons for crane runways recently talked about. The Newport News yard which has had in prospect a much larger tonnage for enlargements, probably will order ahead this work. Strong pressure for tonnage continues to be laid upon eastern shape mills and active order books are large. Various buyers are asking for last half contracts on which the producers are slow to quote. Deliveries extend into many months. One eastern Pennsylvania shape mill, which was naming 3.50c, Pittsburgh, on attractive trade, has advanced to 3.75c, Pittsburgh, and is naming 4c, Pittsburgh, on small lots. Eastern mills now generally ask these prices on standard sections, while on ship shapes 4.50c, Pittsburgh, is wanted. A new export inquiry for 2,000 to 3,000 tons of angles for ship construction has been put out by the French government.

Structural Shapes Active

Pittsburgh, March 20.—While no large contracts for structural material have been placed in the Pittsburgh district this week, numerous inquiries are pending for specific work involving approximately 30,000 tons. Structural shapes are being held at 3.60c for delivery at the convenience of the manufacturer. No tonnage is offered for nearby shipment.

Shape Demand Has Slackened

Chicago, March 20.—New business in structurals placed in the west during the past week was light. Whether the recent increase in the price of structural shapes to 3.79c, Chicago, has had this effect is uncertain, but the change from the comparatively active demand of the past few weeks is marked. The largest project closed in the west involves 1,350 tons for a bank building at Dallas, Tex., which will be furnished by the Mosher Mfg. Co. A library building for Leland Stanford University in California involves 821 tons; it will be furnished by the Vulcan Iron Works. A. Bolter's Sons have taken a contract for 108 tons for a power house at St. Mary's training school, at Des Plaines, Ill.

CONTRACTS AWARDED.

Union Carbide Co., Niagara Falls, N. Y., plant addition, 180 tons, to Lackawanna Bridge Co., Buffalo.

Lehigh Valley railroad, Buffalo, two roundhouses, 150 tons, to Kellogg Structural Steel Co., Buffalo.

Wright & Pomeroy building, Buffalo, 100 tons, to Buffalo Structural Steel Co., Buffalo.

Office building for Chase Brass Co., Waterbury, Conn., 1,000 tons, to the American Bridge Co.

Commercial National Bank building, Washington, 500 tons, to the American Bridge Co.

Column cores for the Strawbridge & Clothier store, Philadelphia, 700 tons, to the American Bridge Co.

Department store, Hartford, 1,000 tons, to the Berlin Construction Co.

Bridge work for the Chesapeake & Ohio railroad, 200 tons, to the American Bridge Co.

Crane runways for the Bath Iron Works, Bath, Me., 300 tons, to the Berlin Construction Co.

Jacksonville terminal, 600 tons, general contract to Irwin & Leighton, steel work still pending.

Seven small bridges for Pennsylvania railroad, 860 tons, to independent shops.

Structural steel for bank building at Dallas, Tex., 1,350 tons, to Mosher Mfg. Co.

Leland Stanford University, Library building, Santa Clara county, Cal., 821 tons, to Vulcan Iron Works.

St. Mary's Training School, power house at Des Plaines, Ill., 108 tons to A. Bolter's Sons.

Building for the Standard Car Construction Co., Sharon, Pa., 400 tons, to the McClintic-Marshall Co.

CONTRACTS PENDING.

Power house for the Westinghouse Electric & Mfg. Co., Essington, Pa., 600 to 700 tons, bids being taken by Westinghouse, Church Kerr & Co., engineers, New York.

Buildings in Cuba for the Hershey Chocolate Co., Hershey, Pa., 1,200 tons, bids being placed.

Forge and machine shop for the Camden Forge Co., 350 tons, bids being taken.

Repair shop at Ivy Rock, Pa., for Alan Wood Iron & Steel Co., 800 tons, bids being taken.

Five grade crossings in western New York for the New York Central railroad, 1,000 tons, bids being taken.

Aeroplane hangars for United States government, maximum number of 12, 5,000 to 6,000 tons, Ferguson Iron & Steel Co., low bidder.

Richmond terminal, Richmond, Va., 1,500 tons, revised bids being taken.

Bridge for the Pennsylvania railroad, Manyunk, Pa., 1,000 to 1,100 tons, bids entered.

Extension to power plant of the American Gas & Electric Corporation, near Wheeling, 3,000 tons, bids being taken.

Tubular Goods Strong

Pittsburgh, March 20.—Recently published reports to the effect that the Sinclair Oil & Refining Co. had distributed orders for 500 miles of 8-inch steel line pipe, apparently refer to a contract awarded about 60 days ago. Demand for steel and iron pipe continues exceedingly heavy, and it is likely that prices will be advanced further at an early date. Deliveries are deferred from three to 12 months. Manufacturers of boiler tubes are quoting only upon application, not wanting to incur additional obligations for delivery this year. Automobile builders have been active buyers of seamless tubing for housings.

(For complete prices see page 700)

Cast Pipe Advance

Pig Iron Market Advance Reflects on Pipe Prices

New York, March 20.—Makers have adopted a new advance of $3 per ton, in order to keep up with the rapidly rising pig iron market. This makes an advance of $4 in pipe in two weeks. The new schedule for 6-inch, class B, is $45.50, and for 4-inch, $45.50, New York. Class A pipe is $1 higher. Business is active. The city of Rochester, which took bids on 10,000 tons of 37's, has decided to use riveted steel pipe instead, and has awarded the contract to the T. A. Gillespie Co. About 5,000 tons of steel will be required, it is estimated. The Warren Foundry & Machine Co. has received 1,000 tons of pipe for Rochester under another recent bidding, and probably will receive 500 tons of 4 to 18's for Ogdensburg, N. J. Boston will receive bids March 26 on 2,600 tons of 4 to 40's. Bids are going in today on 7,000 tons of 42's for Hartford and will be taken on Thursday on 2,250 tons of 6 to 12's for Canton, N. Y. Private inquiry also is larger. Export inquiries are numerous, but sales are few.

Cast Iron Pipe Up $3

Chicago, March 20.—The expected advance on cast iron pipe has been announced and adds $3 per ton. This brings 4-inch pipe to $48.50 and 6-inch and larger to $45.50. Apparently the present high level of cost has reduced buying materially. At present almost nothing is under consideration and several towns taking competitive bids recently have rejected all tenders and in some cases will not advertise again. The letting at Winnipeg for 5,000 tons of large pipe, which was postponed, has been set for April 16. Scotts Bluff, Neb., will open bids April 3 on 325 tons.

The Oklahoma Iron Works, Tulsa, Okla., has contracted for a 240-kilowatt, 1-ton, Rennerfelt electric furnace, which will produce steel for oil well castings. The company is building a new steel foundry.

Heavy Buying Boosts Scrap

In Eastern Territory—Embargoes Off in Cincinnati District—Chicago Market and Other Western Centers Quiet

Philadelphia, March 19.—Some large purchases of heavy melting steel by eastern Pennsylvania consumers have boosted that grade $1 a ton, and this advance has signalized a general forward movement of the market both in prices and in the volume of business. A leading eastern Pennsylvania plate maker closed for 25,000 tons of heavy melting steel at $24.50 and $25, delivered. A Schuylkill valley works placed 5,000 to 10,000 tons at $24.50. A rerolling mill bought 8,000 to 10,000 tons of rejected rails from an eastern Pennsylvania maker at $31.50, mill. Rolling mills are in the market actively for No. 1 railroad wrought, but as the supply is limited, considerable of this demand is unsatisfied and prices have been bid up $2 a ton more. The foundries in general are buying heavy cast at higher prices. Practically all other grades of scrap are more active and higher.

Scrap Active in New York

New York, March 20.—Activity is general throughout the iron and steel scrap list and prices continue to rise. Middlemen are in the market for tonnages of heavy melting steel to cover large orders just taken at from $24 to $24.50, delivered eastern Pennsylvania. They are buying in steel around $21.75, New York, and report considerable material is available on that basis. Nearby foundries are placing numerous orders for cast scrap at from $24.50 to $25, delivered Jersey points, for No. 1 heavy. City wrought has advanced sharply. Strength predominates the market, as consumers, apparently impressed by the rapid rise in pig iron are losing little time in getting their scrap requirements under cover. As compared with iron, scrap offers considerable price attractiveness.

Cleveland Market Steady

Cleveland, March 19.—The market for iron and steel scrap in the Cleveland district is marking time, following the high prices set a few days ago. The large interest in the market for a heavy tonnage of heavy melting steel has not yet closed.

Melting steel is quoted at $23 to $24. Other lines have been marked up in proportion. The sentiment in this territory for a higher market has not lessened; and higher prices are looked for within a few days.

Shipments of scrap were delayed over the week-end by the accidental cessation of work by railroad trainmen who thought, at 6 o'clock Saturday night, that the threatened strike was on. Notification to the contrary came several hours later.

Scrap Displays Strength

Pittsburgh, March 20.—Nearly all grades of iron and steel scrap reflect strength at Pittsburgh. Consumers of busheling in the Cleveland district and of wrought scrap in eastern territory have been active buyers of material in western Pennsylvania for 10 days or a fortnight. No. 1 busheling is commanding as high as $20 a ton, and wrought scrap has been sold at $28 a ton, for eastern delivery. Heavy melting steel is hovering around $23 to $24. The railroad embargo against the shipment of scrap to the Pittsburgh Steel Co., at Monessen, Pa., has not been lifted.

Scarcity in Buffalo

Buffalo, March 20.—The urgent demand for heavy melting steel developing over the turn of the week, according to dealers in this district, will cause prices to advance sharply. A scarcity of the product is noted now. Large consumers are virtually competing to have their needs booked while present prices or slightly higher prevail. There is also a good demand for both cast and wrought scrap, old car wheels and No. 1 busheling scrap as well as low phosphorus steel scrap.

Chicago Scrap Strong

Chicago, March 20.—Strength continues in the Chicago market for iron and steel scrap and quotations are advancing steadily. Expectations of a short supply and heavy demand cause dealers to hold material rather than seek to dispose of it. Consumers are buying wherever prompt delivery can be obtained, to furnish a supply in place of delayed shipments which the railroad situation has held back.

Railroad offerings are not heavy, running lower than had been expected when the weather began to make gathering easier. The Michigan Central railroad is offering 1,100 tons, the Soo Line 475 tons, and Geo. W. Jennings 3,900 tons. The latter list contains 500 tons of steel axles, 450 tons of No. 1 wrought, and 950 tons of cast iron wheels.

Embargoes are Raised

Cincinnati, March 19.—The iron and steel scrap market is in a much better condition today than a week ago. Railroad lines are now open for shipment to Canton, O., and Cleveland, and embargoes have also been lifted to numerous other points in northeastern Ohio. Since inquiry has come mostly from Cleveland and the valley in the past three weeks, dealers are at present able to send out better shipments than in the past month. Prices are unchanged. The situation is undoubtedly strong, but recent embargoes have forced dealers to pile considerable material in their yards, and this will now be thrown upon the market, which may have a tendency to weaken conditions. Heavy melting scrap is selling today from $22 to $23 a gross ton, f. o. b. Cincinnati.

(*For complete prices see page* 700)

St. Louis Market Up

St. Louis, March 19.—The feature of the scrap market at St. Louis last week was a sharp advance in prices of nearly all grades. The most radical advance was in heavy melting steel and No. 1 wrought iron scrap, of which there appears to be a pronounced scarcity. Several of the larger consumers were in the market for melting steel, but no big sales were reported, as mills do not seem willing to take scrap at prices which brokers are paying the railroads. Enormous quantities of scrap have been tied up by the railroad congestion. For this reason consumers who have large tonnages under contract are suffering for want of scrap at mills.

Consumers Pressing Dealers

Birmingham, Ala., March 20.—While there is a little more activity in scrap in the south, with dealers announcing healthy stocks in hand, quotations show no changes. There is considerable purchasing of scrap and consumers are asking for concessions. Dealers, however, reiterate that in comparison with the pig iron and steel market their prices are entirely too low. There is more scrap being used now than for some time. Old steel axles hold at $35 and $36, while old steel rails bring $18 to $18.50. Shop turnings can be had at $8 and $8.50, and stove plate at $11 and $11.50. Car wheel quotations are still around $16 and $16.50 per ton, and heavy melting steel, for which there is an active demand, is $16.50 to $17. The Anniston Steel Co., an electric steel concern, is purchasing scrap heavily.

B. H. Whitely Dead

Chicago, March 21. (By wire.)—Burt H. Whiteley, president, Whiteley Malleable Castings Co., Muncie, Ind., for 20 years, died at his home in Muncie, early Wednesday morning. He had been in bad health for five years.

New Foreign Rail Inquiry

Over 100,000 Tons Involved in One Lot—French May Not Buy—More Locomotives Taken

New York, March 20.—Some large new negotiations for rails for foreign delivery have been opened with the mills. These call for important tonnages. One of them is well in excess of 100,000 tons, including the fastenings and is of a very interesting character. Nothing has come out of the large inquiries for rails for the French government recently quoted upon by the mills and the opinion now is expressed that the distribution of this further tonnage will not be carried out at this time.

Car business has continued more active.

Pending car inquiries, exclusive of foreign business, total about 7,000. The 2,000 for the Reading and the 2,000 for the Seaboard Air Line are the principal lots in this total. The Havana Central has asked for 600 flat and 300 box; the West Kentucky Coal Co. for 300 hoppers; the Indian Refining Co. for 75 tank; the Chicago Short line for 20 flat; the J. G. White Engineering Corporation for 30 hoppers and five flats; the Lorain Steel Co. for 30 gondolas; the Michigan Alkali Co. for 20 gondolas and the Alpha Portland Cement Co. for 50 mine cars. The Colorado & Wyoming wants 200 bodies. The additional orders closed include 125 tank cars for the Burlington to the Standard Steel Car Co. and 200 hoppers for the Maine Central to the same builder.

Locomotive orders include 10 for the Nashville, Chattanooga & St. Louis to the Baldwin Locomotive Works and two for the Copper Range railroad to the American Locomotive Co. The Delaware & Hudson railroad has inquired for 2,000 to 2,500 kegs of small spikes for last half delivery.

Spikes Advanced $3

Pittsburgh, March 20.—Railroad spikes have been advanced $3 a ton to 3.75c for standard sizes. Rather heavy tonnages have been sold at that figure. Angle bars for standard sections now are being held at 2.75c for delivery at the convenience of the maker. It is not unlikely that prices of light steel rails, track bolts and other track equipment will be marked up at an early date.

Rail Sales Light in West

Chicago, March 20.—Comparatively few steel rails were sold during the past week and the total business does not amount to a substantial figure. Track fastenings, however, are fairly active and one sale of tie plates totals practically 10,000 tons. Other sales were of small tonnages.

No Car Buying in West

Chicago, March 20.—Buying of railroad cars is practically absent from the western market and little inquiry is being entertained. The Milwaukee Electric Railway & Light Co. is asking figures on 200 gondolas and the National Dump Car Co. on 300 gondolas.

Spot Coke Lower

But Sales to Furnaces Have Not Been Large—Cars Moving Better

Pittsburgh, March 20.—Consumers of Connellsville coke greatly were relieved when the threatened strike of railroad employes was averted. Blast furnace managers dependent upon the Connellsville regions' for fuel had not more than two or three days' supply of coke on hand last Saturday. Some inconvenience was caused, when about 1,000 men employed by the Baltimore & Ohio and the Pittsburgh & Lake Erie roads, not knowing that the strike had been postponed, walked out last Saturday evening. Fuel this week has been moving freely in all directions, although the traffic situation is not yet normal. It is believed, however, that railroad service gradually will become much better, now that demands of railroad employes have been met.

Blast furnace coke for spot shipment is being offered freely at $9, ovens. Sales, however, have not involved much tonnage. For shipment in the second half of the year, dealers are asking as high as $7.50 a ton. Foundry coke is being sold at $10 to $11 for spot delivery, and as high as $7.50 for shipment after July 1. *The Connellsville Courier*, for the week ending March 10, says production of coke was 349,204 tons, compared with 346,212 tons the week before.

Furnace Coke Easier

Philadelphia, March 20.—A New Jersey merchant furnace which is about to resume operations after an extended idleness has contracted for 2,500 tons monthly of furnace coke for the remainder of the year. The price is understood to have been from $6 to $6.25, Connellsville ovens, or from $8.25 to $8.50, delivered. Furnace coke has remained easier in the eastern market during the week. There were several sales each made up of odd carloads at $9, Connellsville ovens. One buyer placed about 1,000 tons of spot low phosphorus coke at from $9.50 to $9.75, Connellsville ovens. There is more inquiry among eastern furnaces for last half coke but prices for that period are not well defined. Sales of about 10,000 tons of Connellsville furnace fuel for delivery over the next several months are reported at $7, ovens.

(*For complete prices see page* 700)

Seek Prompt Coke

Cleveland, March 20.—The threatened railroad strike caused some activity in the prompt coke market last week on the part of furnaces anxious to secure a supply sufficient to meet their requirements in case the operation of freight trains was seriously curtailed. A sufficient supply of prompt coke to meet requirements is available and furnace operations are being maintained at a steady level. Furnace coke continues to command $9 to $9.50, while foundry coke is held at $10 to $11 and has brought as high as $13. Some producers who have been offering contract foundry coke for 6 and 12 months beginning July 1 at $7.50 and $7, respectively, are now asking $8 to $8.25.

Production is Slow

Cincinnati, March 19.—There is considerable selling of foundry coke for prompt delivery at prices ranging all the way from $10 to $15, ovens. Quotations for contract delivery are from $7.50 to $11, ovens. Production in the Wise county, Pocahontas and New River districts is slow. Producers are behind on deliveries, which accounts for the good demand for prompt coke.

Sugar Makers Take Coke from Iron Center

St. Louis, March 19.—About the only feature in the market here is the appearance of inquiries aggregating between 12,000 and 15,000 tons from the northwestern beet sugar interests. The routine trade is suffering from backward deliveries, and a number of consumers are hard pressed for supplies. Forced purchases have resulted in some fancy prices on single car lots.

Production Will Increase

Birmingham, Ala., March 20.—Material improvement in the coke production in Alabama is anticipated when the 37 Koppers by-product coke ovens of the Gulf States Steel Co., near Gadsden, Ala., are put into operation in the next two or three weeks. The output will be upwards of 450 tons of coke a day. Coke prices in

the Birmingham district show no change, small lots for new customers being quoted at $12.50 per ton, while sales of foundry coke have been made as low as $10 per ton. Between $4 and $7 per ton has been done on furnace coke.

To Speed Steel

Daniels to Confer With Manufacturers—In More Conciliatory Mood

Washington, March 20. (By wire.)—Josephus Daniels, secretary of the navy, expects to hold a conference within a week with representatives of steel manufacturers to lay plans to speed up the delivery of material for naval vessels which will be awarded to private builders. He has already taken up the matter with some steel makers by correspondence and he says most of them show an extremely loyal spirit in aiding the government. While he asserts that a few have shown some reluctance, he does not criticize them as published reports indicate. He says he recognizes the fact that mills are filled with private contracts, but declares he will insist, if necessary, that private work be side tracked for the navy department. Daniels has expressed his confidence that manufacturers would do this and that there would be no need of commandeering plants. He says this is a step he is strongly opposed to in the absence of actual necessity.

It is planned to have contracts for steel distributed among plants in proportion to their capacity and to have manufacturers pledge themselves to devote a high percentage of their facilities to government contracts.

Previous tentative plan to purchase steel on a basis cost of production plus a stated percentage of profit have been foregone. Daniels says he realizes that the operations of a steel mill are so complicated that it is virtually impossible to separate overhead charges.

The secretary, on the other hand, will urge that steel be supplied at "reasonable prices." These plans cover steel to be bought direct by private ship builders, in which the navy is vitally interested, both in the matter of expeditious delivery and prices. The navy will itself undertake the construction of some vessels yet to be authorized, among them battle cruisers and perhaps two battleships. Ship and steel plants with government work have been authorized to operate overtime. The President has suspended the eight-hour law and at the same time has authorized the use of the emergency fund of $115,000,000 for expeditious construction.

E. G. Grace, president of the Bethlehem Steel Co., is spending several weeks at Augusta, Ga.

Ingot Production

Of Independent Steel Companies in February and January

Additional independent steel companies have furnished *The Iron Trade Review* during the past week with the records of their ingot production in January and February. These companies produce 21 per cent of the ingots turned out by all the independents, so that the accompanying table shows complete production records of 59 per cent of the independents against only 38 per cent last week.

The figures shown in the table supplement the statistics published last week and the week previous, when the first monthly records of independent steel ingot production ever secured, were presented.

The companies reporting to date produced 871,668 gross tons of steel ingots, including basic and acid open hearth, bessemer and electric furnace ingots in February, against 981,648 gross tons in January. The decline of 109,980 gross tons is largely a reflection of the fewer days in February, as the steel furnaces averaged 31,666 gross tons daily during January and 31,131 gross tons daily during February. The decline of 535 gross tons in the daily average represents a loss from the January rate of operations of only 1.7 per cent. Pig iron production in February fell off 7 per cent from January.

Steel Ingot Output

FIGURES SUPPLIED BY 59 PER CENT OF INDEPENDENTS.

	Feb.	Jan.
Basic O.-H. ingots....	657,699	742,157
Acid open-hearth ingots	27,109	32,487
Bessemer ingots	183,351	202,971
Elec. furnace ingots...	3,509	4,033
Totals	871,668	981,648

Chain Held at 6.50c

Pittsburgh, March 20.—Heavy tonnages of steel chain are being delivered to ship building interests along the eastern seaboard. Manufacturers are experiencing no difficulty in selling material at 6.50c for ⅜-inch proof coil. It is likely that demand for chain will increase as the international situation becomes more serious.

Nuts, Bolts and Rivets

Pittsburgh, March 20.—Advances in the price of nuts and bolts are expected at an early date. Makers of rivets, it will be recalled, put up prices $10 a ton a fortnight ago, following the advance of $7 a ton on the price of steel bars. Demand for all three products is described as very heavy. Ship builders are paying premium prices for early delivery.

(*For complete prices see page* 700)

Railway Show

Now On in Chicago—Steel Products are Displayed

Chicago, March 20.—With iron and steel entering into practically every department of railroad construction and operation, the annual exhibit of the National Railway Appliances Association in the Coliseum this week is of much interest to the iron and steel world. The exhibit is comprehensive and reflects each year the advances made during the preceding twelvemonth in various departments of railway activity.

Perhaps the most noticeable line of exhibits includes the signal and safety apparatus. Tall safety towers with swinging arms, bearing red lights, warning legends and sounding bells, arise on every side, designed to attract attention through two senses to the fact that danger lurks near. Protective devices to keep trains within safety zones, likewise protect passengers on trains.

Probably second in number are the exhibits of rail and frog and crossing companies, with track fastenings of various types designed to give greater stability to the track. Various accessory lines are shown, each designed to make railroading safer and more economical, and material men have obtained space to demonstrate their wares and their application to various railroad uses.

The Associated Manufacturers of Malleable Iron has a booth with a varied assortment of malleable castings used in railroad work. Some have been distorted by application of heavy strains to show ability to withstand breaking. Wedges of malleable iron under a drop hammer are curled into spirals, indicating the malleability of the material and its ability to withstand punishment without fracture.

Strip Steel is Active

Pittsburgh, March 20.—Manufacturers of cold roll strip steel, with one or two exceptions, have disposed of their entire output for delivery the next six months. Although the 7c price has not been withdrawn generally, yet the bulk of the tonnage sold recently has commanded not less than 7.50c. Heavy tonnages are being sold at as high as 8c for future shipment.

Steel Corporation's Earnings Huge

Sustained Impetus to Trade in 1916 Results in Tremendous Output and at Good Prices—Chairman Gary Believes This Will Be Another Good Year—More Plants Building

THE remarkable change in 1915 business, noted in the fourteenth annual report of the United States Steel Corporation, was maintained in an accelerating ratio during 1916, according to the fifteenth annual report of the Steel Corporation for the year ending Dec. 31, 1916, just made public. Gross earnings for the year were $1,231,473,779 compared with $726,683,589 in 1915. The amount available for dividends was $271,531,730 compared with $75,833,832 in 1915. Not only were the regular dividends of 7 per cent on preferred and 5 per cent on common paid in 1916, but also an extra of 3¾ per cent was paid on common.

Heavy gains in production were noted in the past year in the output of all kinds of products. For instance, the total production of ingots in 1916 was 20,910,589 tons compared with 16,376,492 tons in 1915, an increase of about 27 per cent. Blast furnace output increased over 29 per cent to 17,607,637 tons, compared with 13,641,508 tons in 1915. The Universal Portland Cement output increased to 10,425,600 barrels in 1916 from 7,648,658 barrels in 1915. Chairman E. H. Gary, commenting on the general trade conditions, said:

Demand Keeps Active

"The active demand for iron and steel products for both the domestic and export trade, which prevailed at the opening of the year 1916, referred to in last year's annual report, continued during the entire year. These demands exceeded the capacities of the mills and, consequently, prices advanced throughout the year. The tonnage of unfilled orders of the subsidiary companies at Dec. 31, 1916, was 11,547,286 tons of rolled steel products, the highest total ever recorded in the history of the Corporation, and exceeding by 3,741,066 tons, or 47.9 per cent, the unfilled tonnage at close of 1915. The character of the order book is excellent. The bulk of the tonnage covers the needs of buyers for definitive contract work or their requirements for operation and maintenance, thus encouraging the belief that the operation of the mills at their full capacity will be continued for at least the greater part of 1917. The export sales were for cash, and domestic sales were either for cash or on 30 to 60-day terms in accordance with the custom of the trade as to various commodities. Collections have been unusually good.

"During the entire year 1916, the several producing properties and plants of the subsidiary companies were operated at substantially their maximum capacity, except as they were at times prevented by reason of the unusual conditions prevailing as to labor supply and railroad transportation. The production during the year of basic, raw and semi-finished materials and of rolled and other finished products for sale to customers, exceeded, except in respect of cement, the output in any previous year."

All subsidiary companies expended in 1916 a total of $69,392,627 for maintenance, renewals, including blast furnace relining, compared with $43,366,643 in 1915. The aggregate charges from gross earnings to cover exhaustion of minerals and deterioration amounted to $104,576,379, compared with $72,957,988 in 1915, an increase of 43.3 per cent. Taxes levied against the Corporation and subsidiaries, including income and other federal taxes for 1916, reached $26,599,720, an increase

COMPARATIVE INCOME ACCOUNT

For the Fiscal Years ending December 31, 1916 and 1915

	1916	1915	+Increase —Decrease
EARNINGS—Before charging interest on Bonds and Mortgages of Subsidiary Companies.			
First Quarter	$363 110 720 27	$15 082 369 36	+ $48 028 350 91
Second Quarter	83 501 065 24	30 536 467 71	+ 52 964 597 53
Third Quarter	88 159 733 30	41 050 432 47	+ 47 109 300 83
Fourth Quarter	108 225 573 63	53 580 796 79	+ 54 644 776 84
Total for year	$342 997 092 44	$140 250 066 33	+$202 747 026 11
Less, Interest on outstanding Bonds and Mortgages of the Subsidiary Companies	9 422 914 94	9 854 054 69	— 431 139 75
Balance of Earnings	$333 574 177 50	$130 396 011 64	+$203 178 165 86
Less, Charges and Allowances for Depreciation applied as follows, viz.:			
To Depreciation and Extraordinary Replacement Funds and Sinking Funds on Bonds of Subsidiary Companies	32 762 072 38	25 962 164 59	+ 6 799 907 79
To Sinking Funds on U. S. Steel Corporation Bonds	6 785 540 27	6 465 884 26	+ 319 656 01
Net Income in the year	$294 026 564 85	$97 967 962 79	+$196 058 602 06
Deduct:			
Interest on U. S. Steel Corporation Bonds outstanding	21 602 852 90	21 928 633 74	— 325 780 84
Premium paid on Bonds redeemed, viz.:			
On Subsidiary Companies' Bonds	146 277 11	107 210 28	+ 39 066 83
On U. S. Steel Corporation Bonds	870 673 57	864 100 00	+ 6 573 57
Balance	$271 406 761 27	$75 068 018 77	+$196 338 742 50
Add: Net Balance of sundry charges and credits, including adjustments of various accounts	124 969 11	765 813 94	— 640 844 83
Balance	$271 531 730 38	$75 833 832 71	+$195 697 897 67
Dividends on U. S. Steel Corporation Stocks, viz.:			
Preferred, 7%	25 219 677 00	25 219 677 00	
Common, { 1916, Regular 5%, Extra 3¾% / 1915, 1¼% }	44 476 468 75	6 353 781 25	+ 38 122 687 50
Surplus Net Income for the year	$201 835 584 63	$44 260 374 46	+$157 575 210 17

CORPORATION ACCOUNT, UNITED STATES STEEL CORPORATION, FOR FISCAL YEAR, ENDING DEC. 31, 1916 AND 1915.

of $12,959,536 compared with 1915. Of this total, $9,692,009 was for federal income tax, an increase of $7,880,602 over 1915. Inventory valuations as of Dec. 31, 1916, showed a great general increase compared with valuation at the close of the preceding year as follows:

	Dec. 31, 1916.	Dec. 31, 1915.
Ores—iron, manganese and zinc	$50,021,287	$45,532,472
Pig iron, scrap, ferro and spiegel	18,581,072	9,075,586
Coal, coke and other fuel	4,168,595	4,925,090
Pig tin, lead, spelter, cop., nickel, alum. and dross & skim.	10,415,759	7,866,748
Limestone, fluxes and refractories	3,904,814	3,011,134
Rolls, molds, stools, anneal'g boxes, etc.	7,814,775	6,638,562
Mfg. supplies, stores and sundry items not otherwise class.	23,908,526	17,343,454
Ingots—steel	1,930,101	1,790,298
Blooms, billets, slabs, sheet and tin plate bars, etc.	11,659,281	11,658,042
Wire rods	893,491	953,535
Skelp	1,566,349	1,824,779
Finished products	30,612.642	31,091,145
Mining supplies and stores (for ore and coal properties)	4,083,029	2,851,564
R. R. sup. and stores	5,941,113	3,767,177
Merchandise of supply companies	962,945	674,527
Mat'l, labor & exp. locked up in bridge and struc. contrs. ...$41,939,697 Less, bills rendered on acct.. 37,673,716	4,265,981	1,996,438
Stks. abroad and on consignment	9,738,287	6,857,423
Material in transit	4,957,751	3,255,926
Total	$195,425,798	$161,113,900

The expenditures in 1916 for additions to properties, new construction, mine stripping, etc., aggregated $59,563,983. For these purposes the Corporation has expended since its organization $553,377,684.

The average number of employes during 1916 was 252,668 compared with 191,126 in 1915, an increase of 32.2 per cent, the comparison with 1915 following:

Employes of	1916. Number.	1915. Number.
Mfg. properties	187,289	140,875
Coal and coke prop.	25,143	19,485
Iron ore properties	12,624	9,668
Transp. properties	24,189	18,240
Misc. properties	3,423	2,858
Total	252,668	191,126
Total salaries and wages paid	$263,385,502	$176,800,864
Average Salary or Wage per Employe Per Day:		
All employes, exclusive of general adminis. and selling force	$3.29	$2.92
Total employes, incld. gen'l adminis. and selling force	$3.36	$3.01

Domestic shipments in 1916 showed a gain of 36 per cent, not including cement, which increased 32.8 per cent. Export shipments increased 3 per cent. The average increase price received in 1916 over the previous year

Domestic shipments:	1916. Tons.	1915. Tons.	—Increase.— Tons.	Per cent.
Rolled steel and other finished products	13,075,295	9,331,363	3,743,932	40.1
Pig iron, ingots, spiegel, ferro and scrap	524,885	543,193	18,308	3.4*
Iron ore, coal and coke	1,172,958	1,004,323	168,635	16.8
Sundry materials and by-products	160,483	103,869	56,614	54.5
Total tons all kinds of mat'ls, except cement	14,933,621	10,982,748	3,950,873	36.0
Universal Portland Cement (bbls.)	10,861,426	8,176,583	2,684,843	32.8

Export shipments:	1916. Tons.	1915. Tons.	—Increase.— Tons.	Per cent.
Rolled steel and other finished products	2,466,793	2,350,524	116,269	4.9
Pig iron, ingots and scrap	32,636	78.244	45,608	58.3*
Sundry materials and by-products	2,198	971	1,227	126.4
Total tons all kinds of materials	2,501,627	2,429,739	71,888	3.0
Aggregate tonnage of rolled steel and other finished products shipped to both domestic and export trade	15,542,088	11,681,887	3,860,201	33.0

*Decrease.

Products	1916	1915
IRON ORE MINED		
In the Lake Superior Region	*Tons*	*Tons*
Missabe Range	24 928 039	17 209 664
Vermilion Range	1 314 002	1 273 825
Gogebic Range	2 369 460	1 277 419
Menominee Range	996 983	939 304
Marquette Range	647 132	618 108
In the Southern Region		
Tennessee Coal, Iron & R. R. Co.'s Mines	3 099 553	2 351 356
Total	33 355 169	23 669 676
LIMESTONE QUARRIED	7 023 474	5 795 925
COAL MINED		
For use in the manufacture of coke	26 606 041	20 800 204
For steam, gas and all other purposes	6 162 340	5 828 278
Total	32 768 381	26 628 482
COKE MANUFACTURED		
In Bee-Hive Ovens	12 479 160	9 701 692
In By-Product Ovens	6 422 802	4 799 126
Total	18 901 962	14 500 818
BLAST FURNACE PRODUCTION		
Pig Iron	17 412 049	13 517 598
Spiegel	31 486	7 175
Ferro-Manganese and Silicon	164 102	116 735
Total	17 607 637	13 641 508
STEEL INGOT PRODUCTION		
Bessemer Ingots	7 273 766	5 584 198
Open Hearth Ingots	13 636 823	10 792 294
Total	20 910 589	16 376 492
ROLLED AND OTHER FINISHED STEEL PRODUCTS FOR SALE		
Steel Rails (Heavy and Light Tee and Girder)	1 533 681	1 129 832
Blooms, Billets, Slabs, Sheet and Tinplate Bars	1 881 526	1 404 443
Plates	1 332 262	974 741
Heavy Structural Shapes	1 029 682	726 082
Merchant Steel, Bars, Hoops, Bands, Skelp, Etc.	2 715 277	2 118 366
Tubing and Pipe	1 338 892	919 280
Wire Rods	278 197	261 036
Wire and Products of Wire	2 004 494	1 771 945
Sheets (Black and Galvanized) and Tinplates	1 780 642	1 368 178
Finished Structural Work	557 953	476 896
Angle Splice Bars and All Other Rail Joints	277 271	190 758
Spikes, Bolts, Nuts and Rivets	95 006	74 289
Axles	173 530	95 476
Steel Car Wheels	107 167	77 569
Sundry Steel and Iron Products	349 122	173 748
Total	15 460 792	11 762 639
Spelter	55 898	32 031
Sulphate of Iron	46 263	35 377
	Bbls.	*Bbls.*
Universal Portland Cement	10 425 600	7 648 658

PRODUCTION OF RAW, SEMI-FINISHED AND FINISHED MATERIAL BY SUBSIDIARIES OF THE UNITED STATES STEEL CORPORATION IN 1916 AND 1915.

for finished steel products shipped was $13.27 a ton. Domestic shipment valuation increased $11.45 a ton for 1915, while foreign shipments increased $20.94 a ton.

The new construction program in 1916 led to a total expenditure of $59,563,983, leaving the amount to be expended on authorized expenditures approximately $137,000,000, including iron ore stripping. It is estimated that about $100,000,000 of this total will be expended in 1917.

A great deal of additional construction was undertaken in the Pittsburgh, Youngstown and Chicago districts. The Duluth steel plant was completed along original plans and in 1916 produced 242,972 tons of rolled steel products, two-thirds of its estimated annual capacity. The cement plant at Duluth produced 710,600 barrels. The 24-hot mill tin plate plant at Gary was practically completed. Two 12,700-ton and six 6,500-ton ore carrying vessels were placed in commission on the lakes and one supply boat, which with four additional 12,700-ton steamers deliverable in 1917, cost in part $3,517,496. The principal new extensions and additions authorized for this year include a tube plant at Gary, including blast furnaces and steel plant as well as finishing mills, plans for which have not yet fully developed. The Edgar Thomson and Duquesne works at Pittsburgh will be improved, and the billet and bar mills at Farrell and the tin plate plants at Shenango and Farrell works. Equipment will be put in service to haul coal on the river from mine to the Clairton coke plant and a pipe line will convey gas from Clairton to plants in the Pittsburgh district. The Duluth, Missabe & Northern railroad has constructed at Duluth a steel ore dock of 384 pockets.

During 1916 three general wage advances of 10 per cent each were made to nearly all employes, on Feb. 1, May 1, and Dec. 15. The total of these advances raises wage rates effective at the close of 1916 about 33 per cent above the rates in 1915. Subscriptions to the common stock at $107 per share were received in January, 1917, from 39,072 employes for an aggregate of 67,410 shares. The pension fund trustees disbursed during 1916 in pensions to retired employes $711,130.33. Pensions were granted to 275 employes, at the close of the year making 3,013 names on the pension roll. Safety work expenses were $848,080, compared with $608,644 in 1915. Fatal accidents in 1916 were 44.46 per cent less than in 1906. Serving on safety committees are 4,773 employes at present. Voluntary accident relief by the companies in connection with work accidents was disbursed to the amount of $2,593,960 in 1916. Sanitation work cost $1,402,798 compared with $953,056 in 1916. Welfare work for employes and their families was continued during the year.

Tin Plate Quiet

Pittsburgh, March 20.—Not enough tin plate is being sold in the open market to give one a line on the price situation. Manufacturers apparently have no additional tonnage for delivery before July 1. Books for shipment after that date likely will not be opened until June 1.

Government Purchases

New York, March 21. (By wire.)—The purchase of copper by the government at figures considerably below the market has aroused interest in iron and steel circles as to whether similar concessions will be expected in these metals in the case of a big war demand. The government is in the market with a new inquiry for a round tonnage of structural material for extensions to the Boston navy yard. Levering & Genrigues have taken 3,000 tons for a department store at Hartford, Conn. There are unconfirmed reports of a number of additional large ship awards to eastern yards.

Embargoes Are Off

Pittsburgh, March 21. (By Wire.)—Strike embargoes declared by railroads last week have been lifted and freight is moving freely in all directions. Frequent reports are heard that prices of tubular goods will be advanced before the end of the week. The last change in prices of pipe was March 5.

Furnace to Blow In

Announcement is made by Superintendent Warren G. Taylor that the Musconetgong furnace at Stanhope, N. J., will resume operations in a few weeks. The resumption of the furnace has been dependent upon whether coke supplies could be obtained. No iron has been made at this plant since September, 1914. Improvements and repairs now are being made about the plant preparatory to blowing in.

The Damascus Bronze Co., Pittsburgh, has purchased additional property, 75 x 100 feet, adjoining the site of its plant.

The Non-Ferrous Metals

Copper **Lead** **Spelter** **Tin**

New York, March 20.—Demand for the non-ferrous metals continues exceedingly dull and there is not enough business really to establish a market. As a result the tendency of prices has been in the downward direction. The exceptions are tin, antimony and aluminum, which are strong, particularly the first named metal, which is advancing as a result of a strong upward movement in London.

There is some demand for copper right along but it involves a small volume in the aggregate. Prices on nearby deliveries reflect a softening tendency, while the figures on the more distant futures are practically unchanged. Electrolytic copper is quoted about as follows, on the basis of cash, New York: March, 36c; April, 35c to 35.25c; May, 34.25c to 34.75c; June, 33.75c to 34.25c; third quarter, 31.50c. Prime lake copper may be quoted at about 35.50c for March shipment. Casting copper for March shipment is selling at around 32.50c.

A little spelter business is moving right along but it is by no means keeping pace with the volume of production. As a result, prices continue to decline, and prime western may be quoted about as follows: March shipment, 10.37½c to 10.50c, St. Louis; April, 10c to 10.12½c; second quarter, 9.75c. Producers are not anxious to exert any selling pressure at these prices but it is difficult to find buyers except at concessions. Some foreign tonnages have been booked during the week at slightly lower than the prices prevailing on domestic business. Brass special spelter now is selling at a premium of about ½c over the price of prime western spelter.

The lead market reflects the same condition as spelter; demand is dull and prices show a softening tendency. The market may be quoted as follows: March shipment, 9.25c to 9.37½c, St. Louis; April, 9c to 9.12½c. Spot lead in New York now can be had at about 9.87½c, New York. Several foreign inquiries have come into this market but they have not been closed.

The aluminum market is strong, and prompt carloads may be quoted as follows: No. 1 virgin, 60c to 62c; No. 1 remelted, 56c to 58c; No. 12 remelted, 40c to 42c. Demand is dull and one reason for the continued strength apparently is that some interests in the outside market still are short on large tonnages which they recently sold for export.

The feature of the antimony market is the scarcity of spot material. Spot is quoted nominally at 31c to 33c duty paid, but prospective buyers have been unable to locate sellers and the indication is that any available spot antimony might be sold at materially higher figures. Prices on futures vary considerably. The market on February shipment from the Orient is around 18c, in bond, and on March shipment around 15.25c, in bond. At the same time however it is likely that fair sized lots could be picked up at less.

(For complete prices see page 700)

Fig. 1—Shell Cases Being Carried from the Marne Front to the Base Over Portable Track

Making Portable Track for France

Light-Weight Sections of American-Made Portable Track Have Greatly Simplified the Enormous Movement of Supplies on the Western Front—The Sections Are Ingeniously Assembled With Extreme Rapidity

TWO mighty armies are fighting for France in her struggle to repulse the invader and to regain lost territory. One army was marshalled almost overnight from the fields and towns of the republic as Germany pushed through Belgium toward Paris. The second great force, the industrial army, was recruited nearly as quickly and is equally as important as the first from a military point of view. The industrial army has found willing volunteers in the four corners of the earth and is straining every muscle to supply this plucky, respect-demanding nation with the appointments of self defense. Important as these two armies are—one to the other—each would be useless and helpless without a complete, infallible system of communication. Success or failure for the men in the trenches is spelled by the perfection of the facilities for carrying the products of the industrial army to the battlefields for the sustenance and munitioning of the fighting forces. In this great work of rapidly transferring thousands of tons of material from the rear to the line of action, portable sections of light-weight steel track have played an important role.

The Importance of Transportation

The chain of transportation cannot have any weak links. In the case of imported materials, the railroads bringing supplies to the ships, the steamers plying the oceans, and the final link between the wharves at Havre, Bordeaux and Marseilles and the trenches must not fail in their function of transporting the burden. Of these three links in the transportation system, the last alone has offered almost insurmountable difficulties to the engineering staff of the French army. The abnormal traffic of heavy motor trucks over the roads for more than two years has rendered them almost impassable in many places. In addition to this destructive effect, the roads, like the battlefields, have been furrowed and plowed by bursting shells until all semblance to highway or even lane is blotched out for miles.

The problem of transporting the heavy supplies of ammunition, food and clothing over the shell-torn fields to the borders of deadman's land has been greatly simplified by the use of portable track. France is approximately as large as the states of Montana and Ohio combined; the part of the country confined to actual warfare is, perhaps, one-tenth of this area, yet within that small section of France there is a network of more than 2,500 miles of this narrow-gage track. These tracks are not merely somewhere in France; they are everywhere in France where fighting is taking place.

The track is made in convenient lengths—1¼, 2½ and 5 meters—which may be readily connected to curved sections, turntables and numerous types of switches and crossovers. The three lengths have three, five and eight ties, respectively. The gage is 60 centimeters. The rails, which are rolled to a special size designated by the French government, weigh 20 pounds per yard. The general appearance of the rail section resembles the standard A. S. C. E. section 16. The general outline of the rail is shown by Fig. 4. The ties weigh about 20 pounds apiece, and withstand a bending stress of more than 4,500 pounds. The general appearance of one of the shorter sections is shown in Fig. 2.

The appearance of the sections and the ease with which they may be laid reminds one of the miniature track and train assortment that delights the heart of every lucky lad. But this track is built to withstand severe service; it is laid by experienced track layers and carries carload after carload of heavy shells to the hungry guns and other carloads of food to the hungrier men. The trains are operated by double-headed Baldwin locomotives, which, after the supplies have been delivered to the trenches, are ready to remove the piles of dirt from the trenches or to serve the ambulance service.

Fabricating Process is Continuous

A large percentage of this portable track is made at the plant of the Lakewood Engineering Co., Lakewood, O., where the rails are sawed to length, the ties are struck up from sheet stock and the sections of track are assembled. The process is a continuous one from the time the rail and tie stock is unloaded in the storage shed until the completed

track sections are loaded into the cars enroute to New York. All of the material moving through the shops is carried on trucks running on light-weight track. The only time the stock is removed from these trucks is when it is placed into machines for one of the few operations of machining, or of assembly.

The raw materials coming from the manufacturer are loaded into the freight cars in bundles weighing about

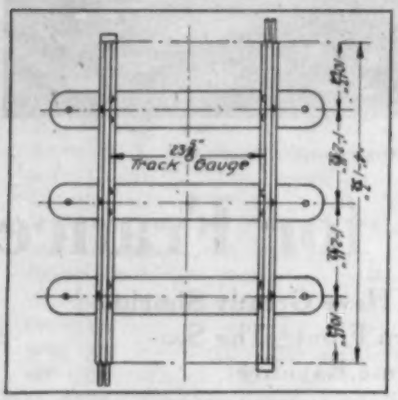


FIG. 2—GENERAL ARRANGEMENT OF SHORT TRACK SECTION

five tons. This step is taken to facilitate the unloading of the cars in the storage shed. The main railroad siding passes approximately through the center of this shed. The bundles of raw material, tie stock and lengths of rails are lifted from the railroad cars by a 10-ton traveling crane, made by the Cleveland Crane & Engineering Co., Wickliffe, O. The rails are stored in piles at one side of the track and the long lengths of tie plates at the other. The same crane rehandles the stock from the storage piles to trucks running on a series of parallel narrow-gage tracks through the fabricating shop. There are three tracks at the left of the fabricating shop and the trucks first carry the rails to a battery of six Cochrane-Bly cold saws where they are cut to the three standard lengths. Moving forward on the trucks, the rails are punched at the ends for the splices which fasten adjacent sections together. After this, holes are punched in the bottom flanges to receive the rivets which hold the ties to the rails. This operation concludes the machine work on the rails unless they are to be used in curved sections. If this is the case, the rails pass through a bending machine which curves them to various standard radii.

How the Ties are Made

While these various operations are performed on the rails, the ties are being formed from plate stock. The material which is used for this purpose comes in long lengths with a cross section 3/16 x 7⅛ inches. The blanks first pass through a double punch, made by the Cleveland Punch & Shear Works, Cleveland, which notches a V-shaped section from each side of the tie strip and then shears tie lengths off at these sections. The notching leaves the ends of the tie roughly rounded, but before they proceed further, the ends are nicely rounded on grinders. After being heated in oil-fired furnaces, the ties are formed in two double bulldozers made by Williams, White & Co., Moline, Ill. An oil-fired furnace is placed on each side of the bulldozers. The partly finished ties are picked from the trucks and placed in the rear of one of the furnaces. After passing through the furnace, the blanks are placed in the bulldozer, which forms them into finished dish-shaped ties, 6 x 44 inches, with a ¾-inch rim.

The tracks carrying the truckloads of rails and ties converge at the end of the fabricating shop and turn into a painting and storage shed. The rails are painted on the web and

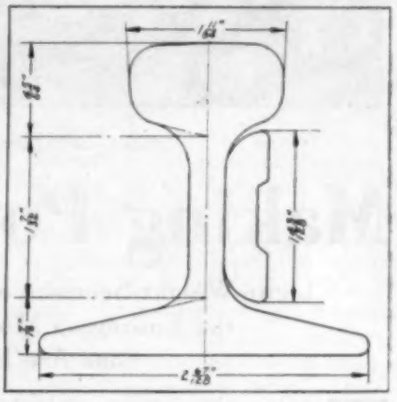


FIG. 4—SECTION OF RAIL SHOWING GENERAL DIMENSIONS

flanges but are not painted on the wearing surface. The ties are covered entirely. It is interesting to note that all the paint is applied with a brush and that 150 gallons are used in a working day of 22 hours. After being allowed to dry in this shed for a short time, the stock is transferred to the right-hand bay of the car shop where the straight track sections are assembled.

A portion of this department is

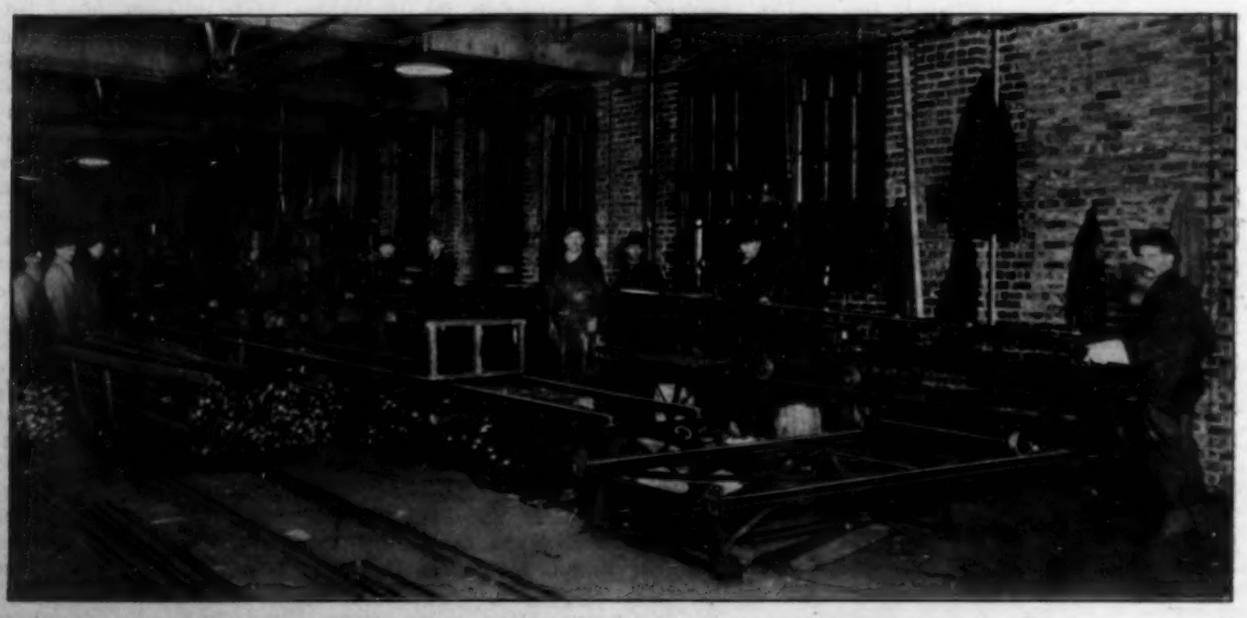


FIG. 3—WHERE THE PORTABLE TRACK SECTIONS ARE ASSEMBLED

shown in Fig. 3; the trucks carrying the rails to be assembled are switched onto the track shown at the left in this illustration. At this point, the ties are punched for the rivets. Small holes are also punched near the ends of the ties. This hole, which is indicated in Fig. 2, provides an exit for the air and water which may be confined beneath the ties when they are placed upon muddy or soggy soil. After the ties have been punched, the truckloads of rails and ties are brought up to assembly racks. Two of these racks are shown in Fig. 3.

Before the rails are ready for the assembly rack, however, the foot plates are riveted in place. These are generally placed on but one end of the rail so that when the section is completed, the foot plates will be at diagonally opposite ends. This arrangement has been adopted to permit of rapid laying of track and ease in interchanging sections.

The elevated track shown at the left in Fig. 3 is used for placing the various parts of the track sections in the proper positions ready for the final riveting. The rails and ties are set in a jig which is carried on a truck running on an elevated track. When the ties and rails have been properly placed in the jig and pins have been inserted in the rivet holes to insure the proper alignment of the parts, the assembly frame is transferred to the elevated track at the extreme right. The riveting machine shown in the foreground rivets one side of the section, after which the carriage is run in front of the second riveter which completes the operation on the other side of the section. Cold rivets, driven by compressed air machines, are used for this work. The three assembly crews working on portable track sections drive about 60,000 rivets in one day.

The center bay of the car shop is used for the production of switches, turntables, etc., which does not lend itself readily to the continuous methods employed in making the regular sections.

The completed sections are carried by the shop trucks back to the storage building or into the loading yard where they are placed in cars ready for shipment to the French battlefields. At the present time the Lakewood company is producing from three to four miles of track a day, requiring 80 to 100 tons of rails and about 75 tons of tie stock, which is formed into approximately 10,000 ties. The contracts completed and active involve more than 8,000 tons of this portable track.

After War Work for Soldiers

At a recent meeting of the Scotch Pig Iron Association, Mr. John R. K. Law, chairman of the meeting, discussed the important subject of what is to be done with the men who are now in the trenches but who will be in need of employment when peace is declared. The speaker considered it probable that these soldiers will not want to take up serious work immediately after their return.

"If our government acts fairly," said Mr. Law, "these men will have their holiday soberly and in turn, but the holiday must be postponed till at least a semblance of form emerges from chaos * * * The government must provide instant work for these unemployed millions no matter whether the work be profitable or unprofitable, though 20 shillings worth of human labor produces only 5 shillings worth of wealth * * * But what work? If we were blessed with an omniscient dictator the task would be easy, useful work would be organized and prepared to the hand of the returning worker. The restoration of the destroyed wealth of our nation and all the nations of Europe could not be too quickly set about * * * but if by any perversity of vision, the government allows individuals to struggle for what work offers, then, God help them."

The speaker suggested four classes of work. (1) Work which is immediately remunerative, a typical example of which is ship building. (2) Work which will shortly be remunerative. The manufacture of pig iron is instanced as an example of this class. (3) Work which will be distantly remunerative, typical examples being afforestation, building of worker's houses, and mending streets and roads. (4) Work which will never be remunerative. The speaker merely expressed the hope that there will be none of the latter class.

Pyrometers---Past, Present and Future

BY RICHARD P. BROWN

AS FAR as we know the ancients who baked excellent bricks and forged iron in their crude way made use of a form of pyrometer used today with ever diminishing success—the eye.

The operation of the first mechanical pyrometers depended upon the difference in expansion of iron and brass. An iron tube containing a brass rod projected into a furnace, and these were mechanically connected to a multiplying movement which caused a pointer to pass around a dial. The difference in expansion of about ⅛-inch was sufficient to move the pointer up to 800 degrees Fahr.

An instrument used quite largely 30 or 40 years ago was the Siemens water pyrometer. A copper ball weighing exactly 137 grams was placed on a piece of steel in the furnace, and after it had fully attained the temperature, it was quickly removed from the furnace and dropped into a vessel containing a thermometer and exactly one pint of clean water. The rise in temperature of the thermometer in the water could be read off in actual temperature degrees on a corresponding scale. The accuracy of this instrument necessarily depended upon exact measurement of the quantity of water in the vessel and the weight of the copper ball which scales away slowly under heat. The time taken to remove the ball from the furnace and drop it into the water must necessarily vary slightly. An accuracy within about 25 degrees Fahr. was, however, usually attained with this instrument. The Siemens water pyrometer is still used today by armor plate manufacturers as they can readily place a number of copper balls on a piece of armor plate which cannot be easily reached by more improved pyrometers. These instruments are in use in the armor plate department of the Bethlehem Steel Co., South Bethlehem, Pa.

The principle on which resistance thermometers operate is the change in resistance of metals due to change in temperature. A coil of platinum or pure nickel wire protected with a suitable tube is inserted at a point where the temperature is to be measured, and with a constant source of current passing through the coil of wire, the resistance increases or decreases, depending on the temperature. This change in resistance can be easily measured as an adjustable resistance is used to balance the re-

From a paper presented before the Steel Treating Research Club, Detroit. The author, Richard P. Brown, is president, Brown Instrument Co., Philadelphia.

sistance of the bulb, and a galvanometer shows when the balance is reached. The adjustable resistance with sliding contact arm can have a temperature scale for direct reading. This instrument is an exceedingly accurate one for measuring low temperatures, but is hardly to be recommended for high temperature service.

For measuring temperatures above 1,000 degrees Fahr., the thermo-electric method has come to be by far the most largely used. A thermo-electric pyrometer consists of a thermo-couple, a measuring device, and wires connecting the thermo-couple and the measuring device. Experience has taught us that for measuring temperatures up to 200 degrees Fahr. a thermo-couple of bismuth and antimony is best. For temperatures to 1,000 degrees Fahr., a satisfactory thermo-couple consists of one wire of iron the other 60 per cent nickel and 40 per cent copper. For the measurement of temperatures as high as 1,800 degrees Fahr., a very satisfactory base metal thermo-couple consists of one wire of 90 per cent nickel and 10 per cent chromium, the other wire 98 per cent nickel and 2 per cent aluminum. The General Motors Co., Detroit, has developed a base consisting of silica, manganese, nickel and aluminum.

For a long time pyrometer builders attempted to duplicate the wire in order to procure thermo-couples which would reproduce the voltage of the previous thermo-couples, but this gave an extensive amount of trouble and no great precision could be secured. Several years ago the policy was adopted of shunting each thermo-couple with manganin wire, reducing the voltage at the terminals of the thermo-couple about two millivolts. Each thermo-couple is adjusted in an electric furnace to a standard, and a maximum error of one-tenth of a millivolt or 4 degrees is permitted. In this way a thermo-couple as sent out produces a definite voltage within 4 degrees Fahr. This method of shunting the thermo-couple also permits of the customer re-standardizing his instrument at intervals.

How Wires Should be Covered

The wires forming a thermo-couple must be insulated from each other throughout their length. This insulation must withstand high temperature, must be a good insulator, and must withstand reasonably severe handling. A common method of insulating base metal thermo-couples is to wrap them with asbestos, and paint the asbestos winding with a solution of sodium silicate. Another method is to fit lava or porcelain beads over the thermo-couple wire. For the platinum thermo-couple the insulation must be of porcelain or high grade fire clay, free from impurities.

The life which will be obtained from any thermo-couple installed in a furnace will very largely depend on the protecting tube over the thermo-couple. For temperatures up to 1,200 degrees Fahr. a high grade wrought iron tube gives satisfactory results. The life of this tube can be increased by calorizing, a process which impregnates the pipe with an aluminum oxide recently developed by the General Electric Co. This will increase the life of the pipe about three times where used at temperatures around 1,400 degrees Fahr.

Use of Compensating Box

Until a few years ago no particular care was taken to take care of the source of error caused by changes in temperature at the cold junction of the thermo-couple. Recently, however, it has been customary to run compensating leads of the same material as the thermo-couple to a distant point, preferably under ground, where the temperature is uniform, instead of having the cold junction just outside the furnace wall, where it might vary several hundred degrees. Where it is possible to place the cold junction in the ground, on account of the furnaces being on an upper floor of a building, a compensating box can be used. This device consists of a lamp and thermostat which will maintain the temperature constant within two degrees. These compensating boxes can be supplied to maintain the cold junction constant for any temperature from 50 to 150 degrees Fahr. The temperature for which the compensating box is set must necessarily be higher than the atmospheric temperature of the room in which it is located.

There are two distinct methods of measuring the voltage produced by a thermo-couple; the millivoltmeter method and the potentiometer method.

The millivoltmeter consists of a permanent magnet with its pole pieces in the field of which a copper wound coil swings in jeweled bearings. Instruments of the millivoltmeter type were in extensive use commercially abroad, and to some extent in this country, as much as 20 years ago, but the instruments were of such delicate construction as to be hardly suitable for general commercial use. Usually they were supplied with the moving coil hung between fine wire suspensions, and were easily broken through jars or handling in transit. These instruments were of high resistance, approximately 300 ohms. On account of the delicate construction of this type of imported instrument, a standard form of switchboard millivoltmeter, frequently used as an ammeter, came into extensive use about 1905, and is still used today. It has a resistance of about 5 ohms, and each individual instrument must be calibrated for a thermo-couple of a certain length and for use with leads or wiring of a definite length. Slight changes in resistance due to changes in the length of the thermo-couple, or length of the wiring, naturally effect the indications, as the internal resistance of this type of millivoltmeter is so low.

In the potentiometer method of temporary measurement, the electro-motive force produced by the thermo-couple is measured by opposing to it a known variable electro-motive force, usually that of a dry cell contained in the instrument, so that when a balance is reached, no current flows. A galvanometer is used to indicate the point at which no current is flowing, and the pointer on the galvanometer then indicates zero, the voltage of the thermo-couple being opposed to the dry cell. The advantage of the potentiometer method of measuring temperature lies in its extreme precision, and its independence of resistance changes throughout the thermo-couple circuit. It has the disadvantage compared with the millivoltmeter method in that it is not direct reading, and that some outside source of current, a dry cell for example, is necessary as a source of current to oppose the thermo-couple.

Radiation Pyrometers

The radiation pyrometer is a development of the thermo-electric pyrometer. Instead of placing the thermo-couple inside the furnace, where the temperature would be so high as to destroy it, it is placed in the back of a tube in front of a mirror. The rays of heat from the furnace enter the tube and strike the mirror and are brought to a focus on the thermo-couple junction. This instrument has a particular field where temperatures must be measured from 2,800 degrees Fahr. up, and it is possible to secure an accuracy within 1 or 2 per cent with this type instrument, if the instructions as to its use are properly carried out. It is not recommended for service where a thermo-electric pyrometer with base metal or platinum thermo-couple can be used.

It is very esential if accurate results are to be secured from pyrometers that they be re-standardized at frequent intervals.

The freezing point of pure salt is an excellent method of testing thermo-

couples, or of the complete pyrometer consisting of the thermo-couple, leads and instrument. Insert a thermo-couple in a small crucible containing pure salt; ordinary table salt is satisfactory, and heat the salt to about 160 degrees Fahr. Remove the crucible from the heat and allow it to cool off. At the freezing point of the salt which will be indicated by the temperature remaining reasonably constant for four or five minutes, the pyrometer should read 800 degrees Cent., or 1,472 degrees Fahr. The melting point of a number of different metals is quite satisfactory for checking purposes. The metals most generally used for this purpose, and their melting points follow: Tin, 450; zinc, 787; silver, 1,761, and gold, 1,945; copper, 1,929; aluminum, 1,157, and platinum, 3,227 degrees Fahr. The bureau of standards at Washington tests pyrometers and thermo-couples for manufacturers in this country, and it is a good plan to have a standard platinum or base metal thermo-couple tested at the bureau since its laboratories can furnish the millivolt values for the thermo-couple. This data can be retained as a primary standard to test the secondary thermo-couple. The cost of such a test is usually about $10.

The greatest future in pyrometry undoubtedly is along the line of automatic temperature control. Instruments which automatically control the temperature of electric furnaces have already been designed. By means of solenoid operated switches the circuit is opened and closed through the rheostat, maintaining the temperature constant within 10 degrees Fahr.

It may be suggested that the various steel manufacturers who are interested in the improvement of heat treating methods, can be of great assistance to pyrometer manufacturers in cooperating with them to test out new devices in an endeavor to improve on present methods. Great strides have been made in this country in the past few years in improved methods of heat treatment, and cooperation on the part of all concerned will mean much greater strides in the next few years.

Industrial Value of Metallography

METALLOGRAPHY as a science is young and as a practice is even younger, as 30 years ago it was almost unknown. Only within the last 20 years has the science received serious consideration by manufacturers and consumers as a valuable means of metal testing. The development in metallography in the early years of its history were slow, but the advances in the past five years have probably exceeded all those previously registered. Originally metallography was a plaything for the scientist; now it is an important aid in many steel works laboratories. Not only in the metallography of iron and steel does it find a wide use, but it is also employed in brass, bronze, aluminum and copper metallurgy, as an aid to the production of uniform metal products.

Metals and alloys owe their industrial importance to their physical properties in large measure, and it is in testing and determining these physical properties that the methods of metallography have come to be almost indispensable. For instance, the great advances in the production of high quality rail steel could scarcely have been brought about without the aid of the new science. The physical properties of metals and alloys are dependent upon their proximate structural compositions rather than upon their ultimate chemical compositions, and it is in revealing the former that the value of metallographic testing lies. The methods of chemistry furnish information of the utmost value, but they do not make possible much knowledge concerning the structure and physical constitution of substances. The modern metallographist is not only a metal microscopist, but, in addition, has an intimate acquaintance with testing machines as well as with analytical chemistry. In fact, this new science has opened the way for a new specialist—the metallographist.

Metallography furnishes definite information regarding the strength, ductility and hardness of a metal or alloy, which, in the final analysis, is of much greater importance than data regarding percentages of impurities. If a sample of steel is given to the chemist, he may report that it analyzes 0.40 per cent carbon. The ultimate structural composition of the steel will be 6 per cent Fe_3C and 94 per cent total iron, disregarding impurities. No idea of the properties of the steel can be gained from the foregoing, as the metal may be hard or soft, strong or weak, ductile or non-ductile, etc. Examination of the same metal under the metallographic microscope will reveal its proximate structural composition at once, and the metallographist will report that the steel contains about 48 per cent pearlite and 52 per cent ferrite, with no free cementite. This report indicates at once that the steel is tough and ductile and still fairly soft.

Speaking in 1904 of the value of metallography and metallographic testing to the iron and steel industry, Sauveur said: "History, however, must repeat itself, and the evolution of the metallographist bids fair to be an exact duplicate of the evolution of the iron chemist; the same landmarks indicate his course; distrust, reluctant acceptance, unreasonable and foolish expectation from his work, disappointment because these expectations were not fulfilled and finally the finding of his proper sphere and recognition of his worth. The metallographist has passed through the first three stages of this evolution, is emerging from the fourth, and entering into the last. For so young a candidate to recognition in iron and steelmaking this record is on the whole very creditable."

At the present day, metallography is taught in almost all technical and engineering schools of university grade, and the methods of metallographic testing find wide use in the metallurgy of iron and steel.

Old Firm Incorporates

Walter Kidde, engineer-constructor, 140 Cedar street, New York, has incorporated the business which he established in 1900 as Walter Kidde & Co., Inc. This company was a pioneer in the practical application of electric motors for individual machine tool drive, which practice in late years has met with general acceptance. The company has made a specialty of foundry construction and was the designer and builder of the plant of the Barlow Foundry Co., Newark, N. J., which has been referred to as a model foundry by the New Jersey state labor commission. In a reorganization of the Barlow Foundry Co., Mr. Kidde recently was elected president of this concern. The officers and the stockholders of Walter Kidde & Co., Inc., are as follows: President, Walter Kidde; vice president, B. G. Worth; secretary and treasurer, I. R. Lewis. In addition to the officers, Henry Lang, vice president of the Ingersoll-Rand Co., New York, and E. S. Boyer, of the American Hard Rubber Co., Akron, O., are directors.

Women coremakers in Massachusetts foundries are not permitted to lift amounts exceeding 25 pounds,

according to the new rules adopted by the state board of labor and industries. They will not be allowed to lift a core exceeding 1 cubic foot in total content, nor may they work on any core whose cubic content is more than 2 feet, nor whose weight exceeds 60 pounds. Another provision allows the board, at its discretion, to require suitable partitions to be erected if the rooms where the women work adjoin core ovens. In the foundry, the responsibility for the ladles, ladle shanks, crucible tongs, yokes, skimmers and slag hose, is placed upon the worker. The rules require that the pouring equipment be inspected daily by men preparing and using them. Other regulations include the width of gangways for carrying molten metal, protection from smoke, gases, dust and harmful drafts and inspection of chains and cables.

Iron Ore From Range to Furnace

BY ELLORY A. ANDERSON

IN THE outskirts of Duluth, where each year millions of tons of iron ore are poured through the gaping hatches of the big freighters to be carried to the lower lake ports, is a little town named Proctor. Proctor isn't very large—it has less than 5,000 inhabitants—but it is the nerve center of one of the important systems of ore transportation. The ore from the Mesabi range near Duluth is found in several different deposits and varies in its analysis. This iron ore is purchased under rigid specifications as to composition. Therefore, it is necessary to sort and grade the ore before it is placed in the boats.

Most of the sampling, grading and billing of the ore from the Mesabi range is effected in units of five cars, so, in discussing the transportation problems encountered in carrying the ore from the range to the furnace, such a unit will be used for illustrative purposes. This unit will be traced from the deposit to the furnace via railroad, loading docks, and steamer.

The ore, coming from the range, is delivered into what is known as the mine yard if it is for an independent concern. When a unit is delivered into the mine yard, a chemist takes samples of the ore for a laboratory test. The chemist is followed by a billing clerk, who makes note of the number of each car in the unit and assigns a waybill number to the unit. The unit is identified by this waybill number until its identity is lost as it is dumped into the hold of the ship.

After the unit has been passed by the billing clerk, it is held either in the mine yard or in an assembling yard of the railroad company until 12 more units have been added to it. Then it is made up into a train and sent to Proctor.

The chemist, during this interval, has completed his analysis of the ore. The general classification of the ore coming from the several deposits is based upon the results of the chemist's analysis. It is graded *one, two* or *three* in general classes with other ores having approximately the same chemical composition. The ore is usually graded before the train and unit arrive at Proctor. The chemist, after he has graded the ore in the unit, calls the operator of the scales at Proctor by telephone and tells him the grade of each unit in the train, identifying the individual units by the waybill numbers previously assigned.

Units are Sorted at Proctor

When the train reaches Proctor, the units of the same grade are sorted and placed together by the chief weighmaster, who has a battery of switch engines at his disposal. It frequently happens that ores from several different mines and of several different grades are to be found in one train. It is, therefore, necessary to graduate the unit according to the character of the ores. Unusual switching facilities are necessary to accommodate the thousands of cars which are to be found in the Proctor yards at one time. At present, the yards have 65 miles of track providing space for 19,000 cars.

The scales which are used at this yard are of more than passing interest. There are two ore scales and one commercial scale of the Fairbanks-Morse type equipped with Streeter-Amet automatic weighing devices. Each morning, a sealed car loaded with iron and weighing exactly 100,000 pounds, is placed upon the scales as a check before the start of the day's operations. As the ore train comes in from the mine yard it does not stop at the scales, but is slowed down to a speed that allows the weighman to record the number and the tare weight of each car as it runs over the platform. The scale automatically records the gross weight of the car and ore. A simple subtraction gives the net weight of the ore.

Grading Units to Secure Cargoes

The problem of grading the units is of particular interest. As a concrete illustration, we will suppose that the grading man has been advised that a certain boat will arrive in a day or so to be loaded with a cargo of 13,000 tons of ore to apply on a specific contract. He knows that this contract calls for a minimum iron content, perhaps a maximum phosphorus content, and frequently a maximum manganese content, in addition to other specifications. The first step is to secure an average of all the elements in each grade on hand. After a few simple calculations, certain tonnages of the different grades of ore may be combined to produce a total of 13,000 tons having the desired analysis. The actual mixing, however, is done by the railroad on the ore dock.

After sufficient units have been graded to make up the cargo, they are grouped into trains of 65 cars each and brought to the ore docks by huge engines of the mallet type. A double set of tracks run over the pockets on the ore dock. The cars are again spotted as they run over these pockets to be dumped. The ore in the original unit is now ready to be dumped in the hold of the vessel by opening a door at the bottom of the pocket. After the cargo is loaded, the dock office sends to the mine officials a statement of the number of every car that carried ore to this particular vessel. The grading man checks these cars from his books and makes an analysis statement, taking the number of the car from the waybill and placing opposite that number the analysis of the ore as indicated by the waybill. After listing these waybills, the general average of all the elements contained in the cargo is obtained. Theoretically, the grading man knows the exact percentage of iron, phosphorus, sulphur, etc., in the ore, which eventually will be refined in the blast furnace.

After a trip of nearly 1,000 miles on the waters of the Great Lakes the boat comes to dock in one of the great receiving ports on Lake Erie. As soon as the boat arrives, great unloading machines start to remove the ore. While the machines are at work, samples are taken of the ore for another chemical examination, which furnishes a basis upon which all independent ores are sold regardless of any variation from the analysis computed by the grading man on the iron range. The remainder of the trip is one of simple railroad transportation.

A resume of a paper read before the Northern Engineers' Society at a recent meeting at Virginia, Minn. The author, Ellory A. Anderson, is associated with the Shenango Furnace Co., Pittsburgh.

Temperature Measurements of Steel

It Appears Highly Desirable for Certain Grades of Steel to Control More Certainly The Temperatures of Furnace Operation—Pyrometric Methods May Be Easily Applied for Determining Casting Temperatures

BY GEORGE K. BURGESS

THE sugestion has often been made that it would be highly desirable, at least for certain grades of steel, to be able to control more certainly, by pyrometric measurement or otherwise, the temperatures of the operation of the open hearth and other furnaces used in the manufacture of steel and iron. That the properties of the ingot and finally of the finished steel product are intimately related to the final temperatures attained by the metal in the furnace and to the temperature of casting, has been recognized by metallurgists for a long time, and this question has been very thoroughly treated, especially by Prof. Henry M. Howe, and by A. W. and H. Brearley.

It is the object of this paper to demonstrate that in so far as casting temperatures of furnaces, steel ingots, and similar operations involving the temperatures of streams of iron and steel are concerned, well-known pyrometric methods may be easily applied —if certain recently determined corrections are made and precautions taken—with a relatively high degree of accuracy. Greater but not insurmountable difficulties will be encountered in the case of open hearth furnace temperatures, while for those of the converter type a ready solution does not seem practicable. It appears that certain essential data have always been lacking in reporting observations such as those of Le Chatelier in 1892. Thus the correction to be applied for the characteristic radiation, or emissivity, has hitherto not been adequately taken into account nor the limitations of the several possible pyrometric methods clearly recognized.

Optical Pyrometers Used

In view of the fact that, in open hearth practice the temperature to be measured in the furnace itself, in the stream of metal and slag and in the teeming into molds or ingots is usually above 1,500 degrees Cent., and may reach to above 1,750 degrees Cent., is is manifest that we are limited to the optical and radiation types of pyrometer. Preference will be given to the former for the reason that the errors in the use of the radiation pyrometer caused by intervening gases, distance, size and specific radiation of objects sighted upon are greater and more uncertain than with the several forms of optical pyrometer using monochromatic light.

Furnace Temperatures

Although one may arrange to observe temperatures of any portion of the open hearth furnace, and also of the slag surface, what one is mainly interested in is the temperatture of the metal, which bears but a remote relation to that of the roof and walls on which the heat of the fuel impinges. Pyrometric control of temperatures of the roof is easy and may be exact and, although some what misleading, may also be made without serious interference from gases and smoke by sighting through suitably placed ports. With a knowledge of the melting range of the roof and arches, the wasting away of the bricks by overheating may be retarded by pyrometric control. Observation of temperatures within the furnace are simpler than of streams of metal or slag for no correction of any importance has to be applied to the optical pyrometer readings for selective radiation.

The temperature conditions in the bath of the open hearth furnace may perhaps be most easily determined by sighting an optical pyrometer through a peep hole in a door or through a port upon the surface of slag, preferably near the center of the bath. This temperature is not usually that of the metal but does not, in general appear to be far removed from the metal temperature especially as the time of tapping the furnace approaches and the fuel supply has been fairly regular and uniform.

The temperature of the metal itself may be determined, but not as readily and surely as one could wish, by removing with a preheated spoon some 50 pounds and sighting upon the surface of the metal contained in the spoon with an optical pyrometer, taking a series of temperature-time readings and noting exactly the instant of withdrawal of metal and of temperature readings, from which data the temperature of the metal in the furnace may be estimated. Here complications arise, such as the slag residue and the formation of oxides on the surface, their solidification sometimes before the steel, and other surface effects dependent upon the condition of the steel, escape of gases, etc., with attendant uncertainties in temperature readings, the speed required in taking readings and other difficulties of rapid manipulation and operations, for which at least three persons are required, whereas one observer is sufficient in taking temperatures of furnace and slag.

At present, no pyrometric method seems adapted to give satisfactorily the temperature of the metal in the bessemer converter. The apparent temperature of the flames may, of course, be observed, but this has yet to be shown to bear any definite relation to the metal temperature. There are fortunately other methods of recognizing the status of the reactions and the moment when a bessemer heat is ready to cast.

Tapping Temperatures

If one can get a side view and within 50 feet of the smoke-free side of the tapping stream of an open hearth furnace, or of a converter, accurate observations may easily be taken of its temperature. Even when sighting upon the stream from a distance good observations may be obtained. The observed temperatures here must be corrected for the emissivity or specific radiation of the metal or slag, a correction depending on the radiation which is characteristic of the stream surface, and upon the colored light used in the pyrometer. The greater brightness of the slag, readily noticed with the unaided eye, is caused by its higher emissivity and, also, in part, sometimes to the fact that it may be slightly hotter than the metal. Slag, however, is not a material of uniform composition nor is its brightness always the same from one cast to another at the same temperature. It follows that pyrometric estimations of slag-stream temperatures may be attended with con-

From a paper presented at the New York meeting of the American Institute of Mining Engineers, February, 1917. The author is chief of the division of metallurgy, United States bureau of standards. A complete paper from which this was taken is to be published by the bureau of standards.

Table I

Bessemer Mill Observations

Heat No.	Apparent temperature of metal pouring from converter	Apparent temperature of pouring into ingot molds 1	2	3	4	5	6	Mean of 1-6	Average true temperature of 1-6	Ladle
29	1,476	1,397	1,377	1,377	1,389	1,369	1,367	1,379	1,500	Spots
30	1,472	1,401	1,387	1,393	1,401	1,397	1,393	1,395	1,517	Spots
31	1,488	1,415	1,419	1,403	1,393	1,383	1,375	1,398	1,521	Spots
32	1,458	1,397	1,389	1,387	1,379	1,387	1,387	1,388	1,510	Spots—clean
33	1,468	1,407	1,401	1,407	1,405	1,403	.....	1,405	1,529	Spots
34	1,454	1,417	1,405	1,431	1,391	1,389	1,413	1,408	1,532	Clean
35	1,462	1,419	1,417	1,403	1,393	1,405	.....	1,407	1,531	Clean
36	1,490	1,434	1,429	1,432	1,429	1,419	1,417	1,428	1,555	Clean
37	.....	.....	.....	.....	1,383	1,372	1,397	1,384	1,505	Skull 4,000 lbs.
38	1,490	1,385	1,393	1,377	1,403	1,385	1,385	1,388	1,510	Cut 1,500 lbs. skull
39	1,478	1,429	1,403	1,393	1,389	1,379	1,377	1,398	1,521	Cut 1,500 lbs. skull
40	1,486	1,424	1,408	1,408	1,401	1,399	1,399	1,406	1,530	Spots—cut 1,000 lbs. skull
41	1,492	1,436	1,401	1,375	1,389	1,424	1,399	1,404	1,528	Clean
42	1,468	1,408	1,403	1,408	1,397	1,391	1,379	1,398	1,521	Clean—spots
43	.....	1,434	1,419	1,409	1,407	1,389	1,372	1,405	1,529	Hot
44	1,488	1,433	1,419	1,409	1,405	1,391	1,383	1,407	1,531	Hot
45	1,474	1,405	1,405	1,405	1,403	1,401	1,387	1,401	1,524	Spots No. 1
46	1,462	1,383	1,383	1,383	1,391	1,383	1,403	1,387	1,509	Spots
47	1,484	1,434	1,432	1,417	1,413	1,413	1,409	1,419	1,545	Warmer—clean ladle
Mean	1,476	1,414	1,405	1,401	1,398	1,394	1,391	1,400	1,523	
*	119	126	124	123	123	122	122	.....	.....	
†	1,595	1,540	1,529	1,524	1,521	1,516	1,513	.....	1,523	

$e = 0.45$ for converter metal. $e = 0.40$ for ingot teeming

*Correction for emissivity.
†Mean true temperature, degrees Cent.

siderable uncertainty. With teeming temperatures we have almost ideal conditions for obtaining accurately the temperature of the stream, which is clean metal with a slight evanescent surface of oxide giving to the stream, view through red glass, a characteristic transparent appearance, the color of the metal being greenish and of the oxide yellow. The corrections to be applied to the temperatures for the emissivity of iron view in red light have been exactly determined.

Pyrometer Stations

The arrangement of the open hearth or bessemer mills is a considerable factor as to convenience with which temperature observations of furnace, tapping, and teeming may be taken. Usually it is possible, however, to bring the pyrometer to within 10 feet of the stream when teeming ingots; but distant observations, even to 100 feet or more, may be taken with but a slight increase in uncertainty. These difficulties of pyrometer stations can usually be readily overcome. It is evidently necessary to have a portable apparatus that may be moved about while taking observations; and one that may be sighted from a considerable distance on a stream issuing from a 2 or 3-inch nozzle.

The observations here described were taken with the Holbron-Kurlbaum form of Morse pyrometer, although, of course, other types of optical pyrometer might have been used. The outfit is portable and readily adjusted and permits taking temperature readings as fast as they can be recorded. The instrument is calibrated so as to give correct temperatures when sighting into a clear, closed furnace at uniform temperature, which approaches the theoretical condition of a "black body", which is said to have an emissivity equal to unity.

The emissivity (e) of a smooth surface of liquid iron free from oxide is 0.37, and no appreciable difference appears to exist between the emissivities of pure iron and of the steels containing considerable percentages of carbon, nickel or manganese, nor is there any appreciable variation of emissivity with temperature. A solid surface of incandescent iron, which has the same emissivity as the liquid, cannot be maintained free of oxide in practice; it is always the oxide which is observed. Liquid iron oxide has a somewhat higher emissivity, 0.53, than liquid iron and a very much less value than the solid oxide the emissivity of which is about 0.92. Liquid slag has a variable emissivity of uncertain limits depending on composition but probably usually ranging between 0.55 and 0.75, and 0.65 is apparently the usual value of e for "dark" slag. For reasons already noted, the emissivity of the metal stream of steel is taken as 0.40 instead of 0.37 in computing true temperatures.

The Observations

In tables I and II are given certain typical series of observations, taken from among many obtained in several large steel plants during the past few years, of furnace and stream temperatures, including all the cases mentioned above. The attempt has not been made here to correlate the ingot or heat characteristics with the temperature, although some data have been accumulated on this subject. It it believed, however, that these observations demonstrate the possibility of obtaining accurate temperature observations for the establishment of any of the numerous correlations which may be suspected to exist; and it is also believed that these observations

Table II

Pouring Temperatures in Open-Hearth Practice

Heat No.	Furnace No.	Apparent temperature of pouring into ladle Metal	Slag	Highest and lowest apparent temperature of pouring into different ingot molds Highest	Lowest	Molds	Apparent temperature average	True temperature, average	Remarks
5	64	1,490	1,540	1,419	1,393	16	1,405	1,529	Spots
3	97	1,464	1,546	1,409	1,367	16	1,390	1,512	8,000 lbs. skull. Melter during teeming said this heat poured hot
5	65	.....	1,545	1,419	1,375	16	1,402	1,525	
3	98	1,431	1,554	1,421	1,403	19	1,410	1,534	500 lbs. skull.
4	62	1,508	1,571	1,407	1,365	17	1,387	1,508	
1	32	.....	.....	1,466	1,393	21	1,420	1,546	Clean
1	25	.....	1,530	1,448	1,389	22	1,407	1,531	
2	10	1,499	.....	1,427	1,367	18	1,401	1,524	Spots
3	73	1,425	1,520	1,427	1,397	18	1,412	1,537	5,000 lbs. skull
3	74	1,429	1,572	.....	.....	..	.....	.....	
4	51	1,490	1,546	1,429	1,397	19	1,413	1,538	Spots
1	36	.....	1,525	1,439	1,389	21	1,414	1,539	
1	41	.....	1,527	1,457	1,410	19	1,414	1,539	Clean
3	80	1,478	1,546	1,450	1,397	20	1,411	1,536	New ladle spots
1	42	1,516	1,545	1,448	1,389	19	1,414	1,539	Hot ladle spots
3	82	.....	1,532	1,424	1,383	19	1,402	1,525	Spots
1	43	1,468	1,532	1,415	1,375	19	1,392	1,514	
Mean	.....	1,473	1,542	1,424	1,392	26	1,406	1,530	
Emissivity correction		134	66	127	122	26	.....	.....	
True temperature deg., Cent.		1,607	1,608	1,551	1,514	26	.....	1,531	

$e = 0.40$ for metal streams. $e = 0.65$ for slag.

indicate the practicability of pyrometric control of open hearth practice, ingot casting and similar operations.

Of course, the tracing out of the effect, say, of casting temperatures upon this or that ingot characteristic, presupposes the possibility of varying mill practice at will; and in any particular case, considering the large number of other variables that may enter, it will probably take a carefully laid out plan involving a considerable quantity of metal, some of which will undoubtedly be scrapped, to accomplish the end sought. This is also a case where the experimental work has to be done on the same scale as in practice.

Observations in Bessemer Mill

Table I gives the record of furnace-casting and ingot-teeming temperatures for 19 consecutive bessemer heats of some 20 tons each of rail steel with a statement of the condition of the ladle as observed by the melter. The temperature estimation of the stream pouring from the converter may be rendered somewhat uncertain by the interference from smoke during the addition of spiegel, and to the intermittent presence of slag, and to the considerable distance from which the stream was viewed since the pyrometer was located on an opposite gallery adjacent to the ingot molds. The temperatures given in the table, for pouring the converter, are each based on a series of observations taken after the addition of spiegel. It is assumed somewhat arbitrarily that the emissivity of this stream is 0.45, corresponding to a temperature correction of 119 degrees Cent., which gives an average converter pouring temperature of 1,595 degrees Cent., which may be somewhat low. If these apparent temperatures were for a more strictly metallic stream ($e = 0.40$), the true pouring temperature would be 1,623 degrees Cent. on the average.

The teeming temperatures were more exact. Each temperature recorded is the average of several observations, usually three or four, taken during the filling of an ingot mold of 3.5 tons capacity, this operation occupying a time somewhat less than a minute. The emissivity of this stream is taken to be 0.40, which is probably exact to within 0.02 corresponding to a precision of 10 degrees Cent. at 1,500 degrees Cent.; the corresponding correction to observed temperatures is about 125 degrees Cent. The observed temperatures are uncorrected for emissivity; the average temperatures only are corrected. The most striking facts these observations bring out are, the relatively narrow temperature range of less than 50 degrees Cent. within which the bessemer converter may be and apparently must be operated, and the corresponding remarkable uniformity of ingot-teeming temperatures.

Table II shows the casting and teeming temperatures for a series of heats and top-poured ingots of rail steel from a bank of 60-ton basic open hearth tilting furnaces. As some four to six minutes are taken in tapping such an open hearth furnace bath, the slag and metal streams may be observed, although it is necessary, on account of the pyrometer station being on opposite gallery, to wait for the smoke to clear away after additions are made to the metal in the ladle. The emissivity of the metal is taken as 0.40, and if that of the dark slag is assumed to be 0.65, the slag and metal streams have on the average the same temperature of 1,607 degrees Cent.

As in the case of the bessemer converter, Table I, but a small variation in temperature from one heat to another is noticeable. The metal had its temperature lowered in the ladle by about 55 degrees Cent. before teeming and ingot 19 was cast on the average at some 35 degrees Cent. lower temperature than the first. The casting temperatures of the open hearth and bessemer practice here shown are seen to differ but slightly. The tapping and teeming temperatures for a series of heats of steel of various compositions from acid and basic open hearth furnaces in another steel plant showed the uncertainty of slag stream temperatures associated principally with the varying color of the slag. It was also demonstrated that all the heats were satisfactory and that the heat of the metal in each case was rated as "hot" which corresponded to a tapping temperature above 1,600 degrees Cent., and a teeming temperature between 1,550 degrees and 1,600 degrees Cent., whereas the teeming temperature of the bessemer and open hearth rail ingots of Tables I and II ranged very closely, about 1,525 degrees Cent. and 1,550 degres Cent., respectively.

Satisfactory detailed observations of the temperatures of tapping of several open hearth furnaces were taken by viewing the stream from the side with the pyrometer within 20 feet of the tapping stream. It was noted that the heat may or may not be distributed uniformly through the metal in the furnace but the uniformity attained would seem to depend, in part at least, on the melter. Thus the temperature of the stream of one heat fell off some 80 degrees Cent. in the two minutes of pouring; that of two heats remained reasonably constant; and the temperature of the stream of a fourth heat increased some 50 degrees Cent., showing that the top of the bath must have been considerably hotter than the bottom. The extreme range here observed in the true temperature of the metal in the tapping stream is 1,710 degrees to 1,520 degrees Cent.

Pyrometer Corrections

Observations of temperatures of open hearth furnaces were made for some of the same heats as the casting temperatures of Table II. The readings of the Morse and Fery pyrometers were corrected for instrument errors, but no correction was applied for emissivity or for absorption of radiation by the gases within the furnace. In the case of the Fery pyrometer, based on total radiation and calibrated in terms of the Stefan-Boltzmann laws the correction is much larger than for the Morse or other optical pyrometer. As the amount of gases in the various parts of the furnace varies from time to time, it was not practicable to make any correction for the absorption of these gases. The use of a total radiation pyrometer to determine furnace temperatures does not appear to be warranted.

Each furnace had three doors with openings through which the slag bath could be observed. The method of firing here used impinged the flames down on the bath surface so that the flames interfered quite seriously with obtaining satisfactory observations. The effect of intervening flames is usually to cause the pyrometer to read too high temperatures. Those taken with the optical pyrometer through the middle door were, however, fairly satisfactory. The furnace casting temperature and that of teeming of first ingot were taken for comparison.

At the regular monthly meeting of the Newark Foundrymen's Association, Newark, N. J., March 7, H. Cole Estep, Cleveland, editorial director of The Penton Publishing Co., publisher of *The Foundry*, read a paper entitled "How Some Cleaning Room Problems Have Been Solved". Mr. Estep's remarks, which were accompanied by about 30 lantern slides, covered methods of cleaning castings in gray iron, steel, malleable and non-ferrous metal foundries. Various types of cleaning room apparatus, including tumbling mills, sand blasting appliances, etc., were described and illustrated.

An Effective Steel Plant Organization for Safety

The Work of the Fire, Police, Sanitation and Safety Departments of the Youngstown Sheet & Tube Co. is Under the Supervision of One Official, Known as Safety Director

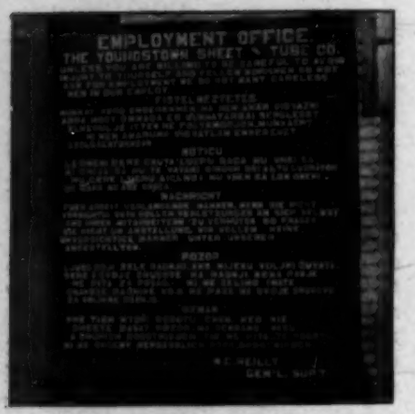


FIG. 1—NEW EMPLOYES ARE WARNED TO BE CAREFUL

THE movement for greater safety in industrial plants has been given such widespread attention during the past decade that the subject as it pertains to actual precautions against injury is more or less tiresome to the average reader of trade journals. To many, the title "Safety Director" means little more than the official name of the man who directs the safety work in a plant. However, in the last few years some of the largest steel companies have found it convenient to link with the traditional duties of this office the supervision of police, fire and sanitation departments and other details allied to this work. Such is the policy of the Youngstown Sheet & Tube Co., which has recently given its safety director complete charge of the organization of police, fire prevention, sanitation and safety work.

FIG. 2—ONE OF THE MANY SAFETY COMMITTEES OF THE YOUNGSTOWN SHEET & TUBE CO.

FIG. 3—A "SAFETY FIRST" BULLETIN AT A PLANT ENTRANCE

The administration of these departments has now been continued for a sufficient length of time to show conclusively that this organization is extremely effective. The system has resulted in greater harmony in the work of the various departments and has materially improved the relations between employer and employes.

Organization of Fire Department

The fire department is in charge of a fire chief who has a number of assistants whose entire time is devoted to the examination of fire apparatus and conditions which contribute in any way to the fire hazard. Throughout the plant are 42 different fire companies, each of which is composed of a captain, hydrantman, two nozzlemen and four hosemen, who drop their work at the sound of the fire gong. An up-to-date fire alarm system, equal in every respect to a modern city equipment, is being installed by the Gamewell Fire Alarm Telegraph Co., New York. This system will consist of 72 alarm boxes and the necessary electric lines and indicators, and will cost approximately $11,000. The fire fighting equipment is distributed in hose houses at convenient points around the property. These houses, as shown in Fig. 5, are hexagon-shaped buildings of matched lumber. Two sides of the hexagon serve as doors, which are fastened by a hasp and staple but are not locked, a small chain and pin arrangement being provided. The interior of a hose house is shown in Fig. 6. Two racks are provided for lengths of hose and coupling wrenches, approximately 300 feet of hose being kept in each hose house. A 4½-inch hydrant equipped with two hose connections stands in the center of the building. A large wheel fastened to the valve spindle simplifies the task of turning on or shutting off the water.

Each hose house is equipped with a red light which hangs directly over the doors and in the center of the building is another incandescent lamp which is automatically lighted when the doors are opened. In addition to the hose houses of the type just described, there are many of the kind shown in Fig. 7 on the roofs of build-

ings. The equipment, consisting of from 200 to 300 feet of hose, nozzles, wrenches, axes, etc., is kept in a rectangular shaped box, the front and top of which serve as hinged doors. A riser connected with the water mains in the ground carries the water to a hose connection near the box, as shown at the right in Fig. 7. It will be noticed that a safety ladder parallels each riser so that the firemen have easy and safe access to the roof equipment. Special care has been taken to facilitate the work of firemen by connecting all roofs by protected runways or ladders.

Payment for Fire Drills

The members of fire companies respond to all alarms while they are at work, and receive regular pay for fire duty. Two fire drills are held each month, and the members of the hose companies are paid 50 cents for each drill. The wages for fire drills are held until the first pay days before July 4 and Dec. 25.

Considerable rivalry between various hose companies has been created by means of contests in which the participants strive to run with the hose cart for a distance of 250 yards, unreel the hose, make all connections and turn on the water in the shortest possible time. Many of the companies have an opportunity to practice during the noon hours. At the annual field meet held by the Youngstown company each year on labor day, the companies compete for annual prizes. The company making the best time receives a prize of $25 and the company with the second best record receives a prize of $16. A silver cup, appropriately engraved, is held by the winning company for a year when it is given over to the next winner.

The numerous patrolmen employed by the Youngstown Sheet & Tube Co. are headed by a chief who is assisted by day and night captains, lieutenants and sergeants. To make the work of these men more efficient a complete patrol system similar to that employed in large cities has been established. A Gamewell system consisting of approximately 90 call boxes and complete indicating apparatus is being installed at the cost of $18,000. Patrolmen are instructed to report from these boxes once every hour.

As each officer reports for duty he is required to sign his name, write the number of his check, the number of his badge and a description of his beat on the register, the desk sergeant witnessing his signature. This procedure serves as a check against misunderstanding of the beat assigned. As the calls from the boxes are indicated in the office of the desk sergeant, they are recorded upon what is known as a call sheet. The name of each officer appears on this sheet and after each name are spaces for each hour and a column for general remarks. Various groups of patrolmen are instructed to report on the even hour; others at 15, 30 and 45 minutes after the hour. This arrangement makes it easier for the desk sergeant to keep the record of calls as they come in. Men who apply for positions as patrolmen, gatemen, guides, etc., must be at least 21 years of age, in normal mental and physical health and must serve a probation period of from 30 to 60 days before they are assigned to a responsible post. The sergeant on duty is required to take a new patrolman over the beat, explain the location of dangerous places, fire risks, location of fire hydrants, extinguishers and stretcher boxes. Patrolmen are instructed to report on the condition of all fire fighting equipment, defective cars, wrecks, derailments, all cases of negligence, damage to material, buildings or tracks. The watchfulness of patrolmen supplements the

FIG. 5—STANDARD DESIGN OF HOSE HOUSE

FIG. 4—ONE OF THE HOSE COMPANIES RESPONDING TO A FIRE DRILL ALARM

FIG. 6—ARRANGEMENT OF EQUIPMENT IN HOSE HOUSE

FIG. 7—FIRE FIGHTING EQUIPMENT IS KEPT IN BOXES ON THE ROOFS OF THE YOUNGSTOWN SHEET & TUBE CO.'S BUILDINGS

work performed by safety inspectors. One of the most important duties of the patrolmen, gatemen and guides is to see that workmen and outsiders are prevented from entering certain parts of the plant. The need for caution has been growing more and more urgent with the increasing seriousness of the international situation. To facilitate this work photographic passes have been provided for each of 10,000 men employed in the various plants. Fig. 8 shows the front and back of the photographic pass which is required of each workman. The card is self explanatory. In Fig. 9 which illustrates four different kinds of passes, *A* shows a card which is issued to construction men who are employed in the plant temporarily. These are not photographic passes as the men to whom they are issued do not work for the Youngstown Sheet & Tube Co. but are employed by contractors and their duties require their entrance to the plant every day for a limited period of time. *B* illustrates a temporary pass which is issued to workmen from outside companies whose duties require them to enter the plant for only a short time. *C* is a photographic pass which admits employes to the benzol plant. Regular employes of the benzol plant wear large conspicuous buttons which show at a glance the department in which they work. *D* is a photographic pass which is issued to employes of the company whose duties frequently require them to enter parts of the main plant, rod and wire mills or coke works.

Investigation of Accidents

In the safety department there are three investigators whose entire time is devoted to studying the accident problem. They are constantly engaged in looking over causes of serious accidents and recommending methods of preventing similar accidents in the future. In addition to these three men there are two accident investigators whose work consists of carefully investigating the circumstances surrounding each accident reported. As a rule their attention is directed only to accidents in which time was lost by the injured man. Frequently, however, these men are called upon to examine the causes of accidents in which certain circumstances prevented injury to any one, but which presented a chance for injury.

All recommendations pertaining to accidents or to safety appliances are considered by a group of men known as the central safety committee. This committee consists of the assistant general superintendent, the chief surgeon, safety director, an inspector of the safety department, and three superintendents or assistant superintendents. This committee receives reports from sub-committees and decides what action shall be taken.

Each plant department has a safety committee consisting of from three to 38 men. Each of these committees meet twice a month, at which times recommendations are prepared and forwarded to the central committee for action. After having decided on what action shall be taken the central committee advises the departmental committee of its decision.

Interest in safety work has been stimulated by various methods. Buttons bearing the Youngstown Sheet & Tube Co. monogram and the words "Safety First" are provided for each member of a safety committee. When the term of a committeeman has expired he is given an attractive watch fob bearing the company monogram and a reference to the safety movement.

In October, 1916, the governor of Ohio proclaimed Oct. 9 as a special day for educational work in preventing accidents. Acting upon this suggestion the safety director of the Youngstown Sheet & Tube Co. arranged for a week of special work

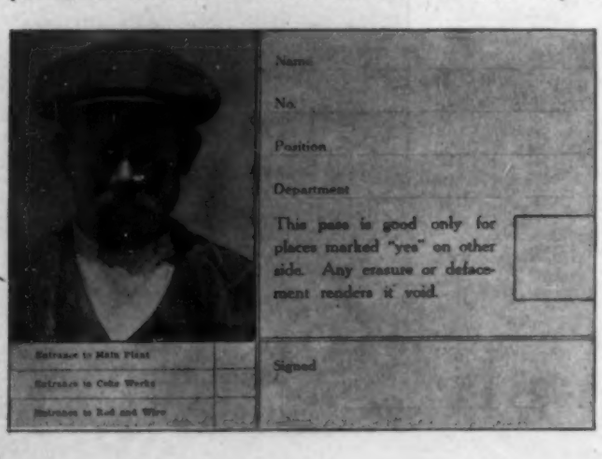
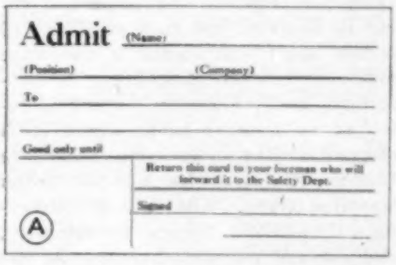

Name
No.
Position
Department
This pass is good only for places marked "yes" on other side. Any erasure or defacement renders it void.
Signed
Entrance to Main Plant
Entrance to Coke Works
Entrance to Rod and Wire

FIG. 8—FACSIMILE OF PHOTOGRAPHIC PASS USED BY YOUNGSTOWN SHEET & TUBE CO. — AN IDENTIFICATION CARD OF THIS KIND IS ISSUED TO EVERY EMPLOYE, AND MUST BE SHOWN WHEN ENTERING ANY DEPARTMENT OF THE PLANT

DO NOT LOSE THIS CARD		KEEP THIS CARD CLEAN
No. 1 Pump House (No. 1 Condenser).		Under Open Hearth Charging Platform
No. 4 Pump House (Blast Furnace).		No. 2 Skelp Mill Engine Room
No. 10 Pump House (Open Hearth).		
No. 12 Pump House (Power Plant).		No. 15 Pump House (Tar).
No. 1 Power House (D. C.).		No. 16 Pump House (Cooling).
No. 2 Power House (Blast Furnace).		No. 9 Boiler House
No. 3 Power House (Low Pressure).		Benzol Plant
No. 1 Boiler House (Yard).		Sewer Under Benzol Plant
No. 2 Boiler House (Puddle).		By-Product Building
No. 3 Boiler House (Steel Plant).		Coke Larry Bridge
No. 4 Boiler House (Blast Furnace)		No. 6 Electric Sub-station
No. 6 Boiler House (Open Hearth).		Car Dumper
Yard Trestle		
Steel Plant Trestle		No. 4 Power House
No. 4 Pump House Intake		No. 14 Pump House
No. 10 Pump House Intake		No. 5 Boiler House
Blast Furnace Blowing Engine Room		Gondola Dumping Table
Steelmaker Blowing Engine Room		Bath Wire Paint Pot
No. 1 Blooming Mill Engine Room		
No. 2 Blooming Mill Engine Room		

in promoting habits of safety. Instructions were given that all foremen who, during the week of Oct. 8, were successful in preventing "lost time" accidents in their departments would receive a 17-jewel, 20-year case watch. On the face of each watch was the Youngstown Sheet & Tube Co. monogram and the caption, "Awarded for Safety Work." Of the 150 foremen eligible for this reward, 135 were successful in avoiding accidents among their men during the week.

In addition to this inducement for more attention to safety work, bulletins showing the standing of various departments were maintained. At the entrance to the works, bulletins containing comparative records for the entire plant were posted. Moreover, the safety director wrote to the heads



of various churches in the city of Youngstown asking that the matter of safety and accident prevention be taken up with the congregations. Instructive articles were also prepared and sent to the city newspapers for publication.

All matters pertaining to the sanitary condition of the plant are in charge of the safety director. Wash rooms, rest rooms, etc., are given daily attention by attendants who are in charge of a foreman, who in turn reports direct to the safety director. Every effort has been made to educate the workmen up to the point where they will appreciate the conveniences that are being provided for them. As has been the case in practically every plant where modern wash rooms, closets, etc., have been provided some of the foreigners have failed to recognize the value of this equipment. The men in the safety department have been confronted with this problem and their policy has been to politely ask the offenders why they object to using the conveniences which have been provided. In practically every case this has led to a better understanding and has partially solved the problem.

An exceptionally complete wash and bath room has been established in the coke oven plant. In addition to the metal lockers for workmen, there is provision for hanging overcoats, coats, shoes, hats and other wearing apparel on racks attached to a chain passing over a pulley near the roof of the building. This arrangement allows each workman to arrange his working clothes on one of these racks and to hoist them to the ceiling where they will dry out. The chains which control the raising and lowering of the racks are fastened to the lower ends of short sections of pipe and an iron band is

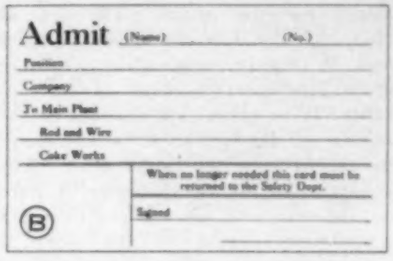
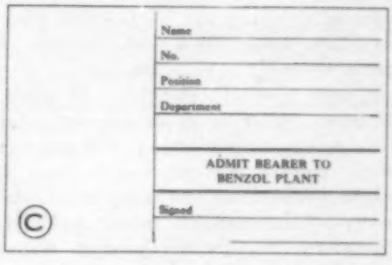


FIG. 9—FOUR DIFFERENT KINDS OF PASSES USED AT THE PLANTS OF THE YOUNGSTOWN SHEET & TUBE CO. TO ADMIT WORKMEN TO VARIOUS DEPARTMENTS—*C* AND *D* ARE PHOTOGRAPHIC PASSES FOR COMPANY EMPLOYES—*A* AND *B* ARE PASSES FOR EMPLOYES OF OTHER COMPANIES



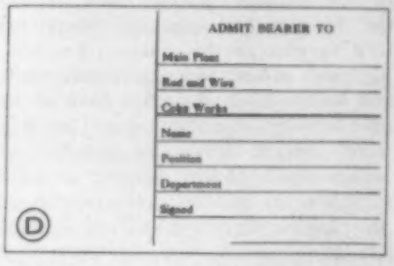
fastened around the chain at a point which marks the extreme height to which the rack may be pulled. Each workman is provided with a padlock with which to lock the chain so that no one can tamper with his clothes. Shower baths are also provided in this building. Wash and bath rooms of similar design are being installed in the puddle mill and sheet mills. Wash room facilities in smaller units are provided at convenient points in all buildings.

Book Reviews

Blast Furnace Construction in America, by J. E. Johnson Jr.; cloth; 415 pages; 6 x 9¼ inches; published by the McGraw-Hill Book Co. and furnished by *The Iron Trade Review* for $4 net.

At the present time when 1916, a record year in the production of iron, has just drawn to a close, and 1917, which has every opportunity for improving the record made by its predecessor, has barely appeared on the threshold of time, a book on blast furnace construction is peculiarly apt, for the manufacture of pig iron, the first process in the manufacture of any and all grades and varieties of iron, takes place in the blast furnace and in the blast furnace only. "The blast furnace is the key which unlocks Nature's stores of iron for our use."

Beginning with the handling of the raw material, the author describes the various methods which have been employed for loading and hoisting the stock to the furnace top. The stock arrived at the top, the process of filling the furnace, "the most important single step in the whole iron-making process", is discussed. The laws of stock distribution, laws arrived at through the "trial and error" method, are given and the various types of



furnace tops, which are in standard use, are described.

With equal thoroughness the author presents his data on the boiler plant, blowing apparatus, the construction and operation of hot blast stoves, the construction of the blast furnace stack, the matter of cleaning and washing the gas, handling the iron and cinder, the use of the dry blast, etc. The book is profusely illustrated.

Microscopic Examination of Steel, by Henry Fay, D. Sc.; 18 pages, 5¾ x 9 inches, with 42 photomicrographs and 14 illustrations; cloth; published by John Wiley & Sons, and furnished by *The Iron Trade Review*, for $1.25 net.

The material contained in Professor Fay's book was originally issued by the United States ordnance department and was intended for the use of inspectors. It presents an outline of metallographic methods and is intended particularly for those who are in need of help in the interpretation of results. Typical examples are given, and the content of the book is confined to the field indicated in the title.

The Rath Metal Products Co., Pittsburgh, now is known as the Gloekler Foundry Co.

Chipping Defects From Steel Billets

The Expense of Removing Cracks and Seams from Shell Forging Billets by Means of Pneumatic Chipping Hammers Can Be Reduced by Employing Systematic Methods of Repairing and Heat Treating

CHIPPING seams and other defects from billets, castings, slabs and other semi-finished steel is a practice so universal that it is surprising that more attention is not given to the cost of the work. Where square billet stock is to be used in shell manufacture, the steel must be in good condition, free from seams, cracks, surface blowholes, etc. The requirements laid down on shell steel are rigid and slight defects are condemned. Any crack or seam in forging billets for shells will appear in the finished product, and usually the forging and piercing operations tend to enlarge the cracks. For rolling fine sheets for automobile body and fender stock, the slabs from which the sheets are rolled must be free from defects, otherwise cracks and seams appear in the finished product. In short, the removal of defects from the semi-finished material is a *desideratum*.

In spite of the exercise of suitable precautions, such as proper deoxidation of the metal in the open hearth furnace and careful rolling practice in the blooming mill, billets and other steel materials often contain cracks and seams. The only practical method of removing these defects is to employ the chipping hammer.

Chipping is a costly practice, and anything tending to reduce the cost is appreciated by works managers. As would be suspected, the cost is variable from plant to plant, the following being cogent factors in its determination: (1) cost of labor; (2) cost of moving and shifting steel into position for chipping; (3) cost of inspection; (4) cost of air hammers including depreciation; (5) cost of chipping-chisels; and (6) cost of grinding chisels.

An investigation of chipping was recently carried out in a large steel plant in the central west, and the work resulted in some new departures in practice as well as in a reduction in the cost. The summation of the results of the experiments and the tests is embodied in the remainder of this article.

Unskilled labor of the cheapest type obtainable proves to be the best suited for this work. The job of chipping has few attractive features and is highly unpopular with the more intelligent workers of the unskilled labor class. On account of the nature of the work, it is a difficult matter to keep the ranks filled. The constant jar of the hammer is hard on the men and the stooped-over position necessitated by the work is tedious, so that the men, as a rule, are either continually quitting or asking to be transferred to another department. There appears to be no way by which the method of chipping may be altered and still accomplish the desired results. Some slab-yard foremen are of the opinion that the problem cannot be solved. That the cost of chipping can be reduced, however, is borne out by the results of tests.

Under present conditions, 25 cents, or more, per hour is an average price paid to chippers working 10 hours per day. Usually no chipping is done at night because of the cost and difficulty of lighting the slab yard sufficiently. In view of the high wages paid for labor, it is necessary to keep the chippers working as constantly as possible, otherwise the costs mount up incredibly. As already stated, the job is a hard one, and chippers will avail themselves of the slightest excuse to stop work. Investigation shows that most of the time lost arises from chisel breakage, or, in general defective chisels. The labor cost is a more or less fixed item, but will vary with the amount of work to be done and the efficiency of the chipping gang. At the plant where the tests were conducted, the labor cost amounted to about $3,250 per month. No bonus system appears practicable because of the nature of the work.

Where billets require chipping, inspection must first take place in order to cull out the defective ones. Billets, as they are cut off to length at the shear, are conveyed in packslings by crane to the inspection table—a series of old rails set 12 to 18 inches apart and raised about knee high on blocks. Inspection is performed, and the defective stock is removed to another table where it is chipped. The conveying may be conveniently done by a 5 to 10-ton traveling crane. The cost of conveying the billets varies considerably, and depends on the percentage of defective billets and on the layout of the yard. At the plant already referred to, the conveying is done at night, the chipping being carried on entirely by day. As soon as the chipping gang stops work at the end of day, the crane removes the chipped billets to cars for delivery to the subsequent mills or to the forging plant. Defective billets to be chipped the following day are then stacked up on the chipping tables in readiness for the chippers in the morning. The cost of moving billets is made up of a crane operator's time and that of a helper on the ground.

Inspection is extremely important in shell work and should be given more attention than it usually receives in routine work for which the specifications are not as rigid. Only competent and trustworthy persons should be employed as inspectors. The cost of inspection is assumed to be the time of one inspector per day at $5.

A number of pneumatic chipping hammers have been

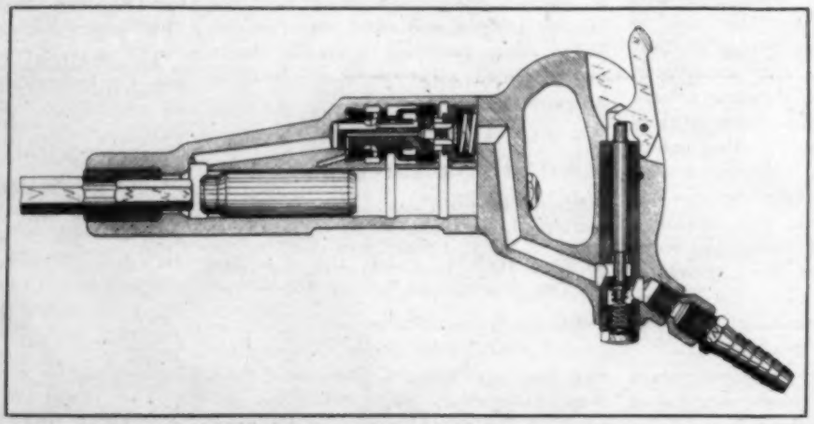


FIG. 1—LONGITUDINAL SECTION THROUGH CHIPPING HAMMER

placed on the market. Fig. 1 shows a longitudinal section through a hammer brought out by the Ingersoll-Rand Co., New York for heavy chipping purposes. This type of hammer was used at the plant under discussion and gave satisfactory service. There has since been a slight change of design in the nozzle which takes the chisel shank, as illustrated in Figs. 2 and 3. Fig. 2 illustrates the nozzle for holding octagonal shank chisels, and Fig. 3 shows the nozzle for holding the conical shank chisels. The latter is more satisfactory than the former. The air consumption per hammer is 19 cubic feet per minute. The cost of air varies from plant to plant, depending on the type of air-compressor and the cost of generating steam.

Care of Hammers

The depreciation charge against air-hammers is a contributing item of chipping cost. The cost of repairs and the renewal of nozzles and other parts are included in the chipping charge.

In order to keep air-hammers in good working condition, they should be properly cleaned and oiled at frequent intervals. For lubrication, a small amount of clean, light machine oil should be poured into the inlet of the handle; when the tool is being used constantly, this should be done every two or three hours. A thick oil should not be used as it causes the moving parts to work sluggishly. For cleaning, the hammer should be taken apart at least once a week, and the parts washed in kerosene. An article on the care of pneumatic tools appeared in the Dec. 21, 1916, issue of *The Iron Trade Review*.

The cost of keeping chippers supplied with good chisels is high at best and will be higher unless care is exercised in their treatment. Any investigation of chipping cost with a view to reducing it inevitably leads to a consideration of the chisel itself. The first cost of chipping chisels varies within wide limits according to whether alloy steel or straight carbon steel is employed, and to whether conically tapering or octagonal shanks are used.

A typical steel for chipping chisels at one plant analyzed as follows:

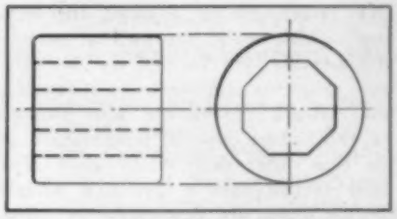


FIG. 2 — OLD TYPE OF TWO-PIECE NOZZLE USED IN AIR-HAMMER

Carbon, 0.70 to 0.90 per cent; sulphur, 0.035 per cent; phosphorus, 0.015 per cent; and manganese, 0.20 per cent.

Each chipper needs from six to 12 chisels on hand at all times. Octagonal shank chisel blanks cost about $0.60, the high price being due mainly to the close machining required. Conical shank chisel blanks cost from

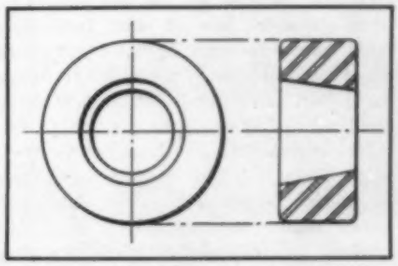


FIG. 3 — NEW TYPE OF TWO-PIECE NOZZLE USED IN AIR-HAMMER

$0.20 to $0.30 apiece. Regardless of the shape of the shank, it is worthless if it does not fit the hammer nozzle.

Lengths of octagon chisel steel approximately 10 inches long may be purchased from jobbers or manufacturers. Where chisels are used in large quantities, as where 50 or more chippers are at work, it is found economical to have the shanks machined outside at contract prices. Forging, shaping and heat treatment are best performed in the plant, because of the necessity for having a repair man on chisels most of the time. The forging and shaping of the cutting end may be done by a tool blacksmith, but heat treatment should be entrusted to more capable hands and executed under close pyrometric control.

Chipping chisels are short lived because of the severe service requirements and because of the rough treatment they receive at the hands of chippers. To stand up successfully under this hard usage, the steel should be put in the best possible condition. No rule-of-thumb heat treatment is effective, and the results of tests conducted unmistakably demonstrate the superiority of chisels treated under pyrometric control. The life of a chipping chisel is a function of any one or a combination of the following factors: (1) Kind of steel and its heat treatment; (2) care observed in grinding; (3) care exercised by chippers; and (4) shape of the chisel.

Heat Treatment Important

Experience has shown that straight 0.70 to 0.90 per cent carbon steel is well adapted for chipping chisels. The chisel point should be of such hardness that it will do the work without breaking off by reason of excessive hardness or yet bend or "dub" over on account of softness. The shank of the chisel, which fits into the nozzle of the air hammer, must also be treated to stand up under the work. It cannot be so hard as to break off through the shock of pounding or yet so soft as to flow under the repeated blows and accordingly become sufficiently wedged to break the nozzle.

A number of experiments were carried out at the plant already mentioned for the purpose of developing a judicious rationale of heat treatment. Previous to the solution of the problem, the chisels were dressed up by the tool blacksmith and given a so-called heat treatment. The latter was conducted by ill-advised, haphazard methods. Strange results followed, as would be expected. One chisel would perform excellent work, while the next dozen or so would be worthless, either so hard as to break

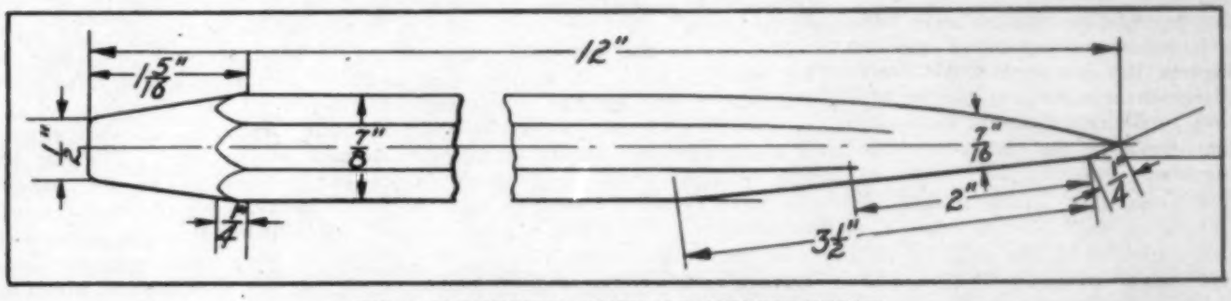


FIG. 4—HALF-ROUND CHISEL OF CORRECT DESIGN

off or so soft as to bend over. On an average, 300 chisels were being dressed and heat treated daily. The cost of this work is made up as follows:

One tool dresser at 40c for 10 hours..	$4.00
One helper at 25c for 10 hours.....	2.50
Coke	.25
Total	$6.75

The experiments for a time showed nothing but negative results as is usually the case, but a suitable treatment was finally devised. Chisels of 0.80 per cent carbon steel were heated to 735 degrees Cent., or just through the critical range, in a gas fired muffle furnace having uniform temperature. Fifty chisels were charged at once and allowed to soak until a pyrometer rod in the middle of the pile showed 735 degrees Cent. The assumption was that the entire pile of chisels had attained at least that temperature. Readings with the pyrometer at different places in the pile showed this assumption to be sufficiently accurate for practical purposes. When up to heat, the chisels were quenched by immersing the point about 1.5 inches in water. The strains induced by this drastic quenching were relieved, and the resultant hardness mitigated somewhat by drawing the chisels at 250 degrees Cent. in a bath of high-flash quenching oil. The drawing temperature was discovered by trial of the chisels. Lead baths for heating the chisels prior to quenching are preferable.

The foregoing treatment proved rapid and effective; a uniformity of product was secured not possible by any haphazard process. The consumption of chisels was cut down considerably and after the system was placed in working order only 50 chisels, on an average, required dressing and heating per day. The cost of heat treating by the improved method is as follows:

One heat treater at 35c for four hours.	$1.40
One tool dresser at 40c for two hours..	.80
One helper at 25c for two hours.....	.50
Gas	.15
Total	$2.85

Overhead charges and cost of carrying chisels are not included.

The improved method shows a saving of at least $3.90 per day, and if the depreciation charges were added a larger saving would be apparent. Figures for the latter would require charges over a considerable period of time. Also fewer chisels are used so that the first cost is reduced over the year.

A great deal of the trouble with chisels, as well as with other tools, arises from ill-advised grinding methods. Heat treatment has been emphasized as an important operation, nevertheless, grinding is fully as essential. Incompetency will easily render the tools defective. The damage caused by improper grinding comes from heating the steel. The steel is injured by "drawing the temper", which really means that sorbite and pearlite are formed as the critical range is approached. Checking and surface cracks are also formed by the sudden rise in temperature of the thin outer skin of the steel. For hard carbon chisels, grinding wheels of fine grain are recommended. The pressure during grinding should be light, so that the steel is not blued or burned. Strictly speaking, chipping chisels should be ground by a competent tool room man. The economy of such a course over having every chipper grind his own chisels is apparent.

Another cause of the short life of chisels is the unnecessary abuse on the part of the chippers. This element is always present whenever new men are "broken in" for the job. The chief trouble lies in the fact that most chippers seem bent on ramming the tool down into the steel to force it to bite and then bending it over suddenly. The result is that the chisel either breaks off or bends over. Such abuse can be largely overcome by closer supervision over inexperienced men.

Some of the trouble with chipping chisels is due to faulty design. Several different shapes were tried out in the recently conducted tests with more or less indifferent results. A half-round chisel proved to be the most suitable for the purpose; and the one shown in Fig. 3 was adopted as standard. It should be observed that there is a slight kink or bulge in the curved surface of the back; this throws the cutting edge on a line with the center axis—both theoretically and mechanically a correct design.

Book Review

Unified Accounting Methods for Industrials, by Clinton E. Woods; half leather; 484 pages, 6 x 8¼ inches; published by the Ronald Press Co., and furnished by *The Iron Trade Review* for $5 net.

The day of the industrial engineer has come to stay. A knowledge of the field covered by this new expert is, therefore, highly desirable, and, if a manufacturer expects to successfully compete with institutions in the same or allied industries, such a knowledge is practically a necessity.

In the words of the author, "The average manufacturer of today might be called the most magnificent gambler the world has ever known. He is a buyer, a producer, a seller and a financier; and in each of these phases of his business he takes a hundred chances where his business brother, the banker, on the one hand, takes none, and the merchant, on the other, perhaps ten. It is these conditions in the industrial world that have given birth to the new profession called 'Industrial or Efficiency Engineering', the purpose of which, broadly speaking, is to provide the manufacturer with a unified code of standards to work under, which will put him on, or somewhere near, the same basis as the banker or merchant in chance-taking."

"Unified Accounting Methods for Industrials" furnishes an instrument for measuring results, in the form of a detailed accounting system fitted to every element in a business, and governed by a set of controling accounts. The treatment is clear and exhaustive. The author first analyzes an industrial manager's monthly balance sheet, demonstrating by figures what unified accounting does and its value as a controling medium in connection with finances, inventions, investments, sales, purchases, etc. In succeeding chapters he discusses methods of making purchases and following them up, the importance and control of general stores, and shows how component and finished stores differ from general stores in character and their method of record.

The steps necessary for the successful handling of production forms the subject matter of one chapter, this being followed by a chapter on the analyzing and grouping of machine tool equipment. An exposition of manufacturing schedules covering labor, material and finances, and a consideration of the relation of these schedules to each other contains much interesting material. Chapter X discusses a method for issuing production and other orders to a factory as a whole, and to individual workmen, together with various forms of collecting the time of employes. It contains also an illustrated description of planning methods and of planning or controling boards. A chapter on the employment and handling of labor succeeds this. The remainder of the book is devoted more exclusively to the discussion of accounting methods in the stricter meaning of the word. The last 100 pages are devoted to the various forms, blanks, orders, etc., the use of which helps to make a working whole of what would otherwise be a more or less disorganized group of men.

Mining Institute Convenes in South

Birmingham Meeting of Lake Superior Mining Institute Thoroughly Enjoyed by Many Delegates—Members Favor Universal Military Training and Plan Nomenclature of Mining Terms

UNIVERSAL military service was the subject of a resolution adopted unanimously by the members of the Lake Superior Mining Institute at the twenty-first annual meeting of the organization, held at the Tutwiler hotel, Birmingham, March 13 to 15. Declaring that "the military history of the world, as well as the military history of our own country, shows that the volunteer system of providing men for the army and navy is the most inefficient and most costly in life and treasure of any known system," the institute further considered it "most undemocratic," with "radical defects and unjust". Therefore, it was resolved, "That the Lake Superior Mining Institute, an organization composed of more than 500 members, in annual convention assembled, declare it to be the deliberate judgment that the congress of the United States should without delay, provide by law for universal military training, and universal compulsory military service in our army and navy, along the line recommended by the general army board, and that the President should sign and put into prompt execution such a law." Copies of this resolution will be forwarded to the congressmen and senators representing the states of Wisconsin, Minnesota and Michigan.

Will Define Mining Terms

The desirability of defining mining terms which ultimately will lead to uniform nomenclature of the technical language of the Lake Superior district, was voiced unanimously, and a committee was appointed to consider this subject with instruction to report at the next convention. The methods of sanitation pursued in the various minds of the great northern iron ore and copper-country are to be codified by a special committee so that the institute members may familiarize themselves with the various systems in use from the viewpoints of utility and economy.

Departing from its custom of meeting annually on one of the Lake Superior ranges, the institute decided to forego the 1916 convention scheduled for the Menominee range, and it was concluded to visit the great mining operation directly connected with iron and steel manufacture of the south and of which Birmingham is the center. The extensive operation of this district and grouping of the necessary raw materials for the making of iron within a very small radius, proved a revelation to the members.

The opportunities afforded the visitors to inspect these operations and the elaborate entertainment provided, again reflected the hospitality for which the south is noted. From the time of their arrival on Tuesday morning, until their departure on Thursday night, the Institute members were busily engaged in sight-seeing tours and inspection trips. Only two business sessions could be crowded into the program, one having been held Tuesday evening and the other, Wednesday afternoon.

New Officers

President, Charles T. Fairbairn, manager of the southern division, Republic Iron & Steel Co., Birmingham.

Vice presidents, two years—W. D. Calverley, Houghton, Mich., and M. E. Richards, Judson Mining Co., Crystal Falls, Mich.

Managers, two years—Alex Chisholm, Newport Mining Co., Ironwood, Mich.; E. I. Grierson, Calumet & Hecla Mining Co., Calumet, Mich., and B. W. Bachelder, Wisconsin Steel Co., Nashwauk, Minn.

Treasurer, Edward W. Hopkins, Oglebay, Norton & Co., Commonwealth, Wis.

Secretary, A. J. Yungbluth, Cleveland-Cliffs Iron Co., Ishpeming, Mich.

Owing to the limited amount of time allotted for technical discussion, all of the papers prepared for the meeting were presented by title only. A symposium of ten papers considered various phases of mining operations on the Menominee iron range, as follows:

"Methods of Mining at the Chapin Mine," by W. C. Gordon; "The Block-Caving System Used at the Pewabic Mine," by A. J. Myers; "The Method of Mining Used at the Loretto Mine," by C. H. Baxter; "Mining Methods in the Iron River District of Michigan," by Rudolph Ericson; "The Methods of Opening and Mining the Davidson No. 2 Mine," by Rudolph Ericson; "The Sub-Stoping Method of Mining as Used at the Chatham Mine," by F. J. Smith; "Mining Methods in the Crystal Falls, Amasa and Florence Districts," by M. E. Richards; "Sub-Stoping at the Amasa-Porter Mine," by M. E. Richards; "Mining Methods in the Florence District," by J. M. Riddell; "Mining Methods, Bristol Mine," by Arvid Bjork.

The following papers constituted the remainder of the program:

"Herringbone Gears Used on Pumps," by Fred M. Prescott; "Mine Accidents Classified by Mining Methods for the Lake Superior District, 1915," by Albert H. Fay; "The Founding of the Calumet & Hecla Mine, 1866-1916;" "Electric Power in Mining on the Menominee Range," by Charles Harger; "Reminiscences of the Development of the Lake Superior Iron Districts," by J. M. Longyear; "Equipping and Sinking No. 1 Shaft at the Holmes Mine," by Lucien Eaton; "Crushing Plant at Brier Hill Shaft," by Floyd L. Burr; "Notes on the Calumet & Hecla Mine Fire," by John Knox Jr.; Iron Ores of Cuyuna Range," by Harlan H. Bradt and C. W. Newton; "Stoping to Branched Raises," by F. W. Sperr; "Recent Geological Developments on the Mesabi Iron Range, Minnesota," by J. F. Wolff; "Signalling System at Bengal Mine, Palatka, Mich.," by A. H. McGregor; "Blasting Explosives and Their Accessories," by Charles S. Hurter.

In his annual address, President Charles E. Lawrence reviewed the development of the Lake Superior region from the time of the organization of the institute in 1893 to the present day. During this period the annual tonnage of iron ore mined has increased ninefold and the cost of operations has been greatly reduced by the installation of ingenious labor-saving machinery. The capacity of steam shovels, he said, had been increased from 25 to 300 tons. The improvement in shaft construction has been almost revolutionary. Secretary Yungbluth presented the names of 28 applicants for membership, all of whom were passed upon favorably.

Delegates Enjoy Inspection Trips

Through the courtesy of the local committee, the visitors made two tours of the Birmingham district in special trains on Tuesday and Wednesday. The first stop was made at mine No. 13 of the Tennessee Coal, Iron & Railroad Co., which, owing to its elevation, afforded an opportunity of viewing the surrounding industries in and contiguous to Birmingham. Muscoda ore mine, No. 4, next was visited and a stop was made at Bayview, where a portion of the impounding reservoir built by the Tennessee company was seen. The run-off area for this reservoir includes nearly 75 square miles and its present effective capacity is 2½ billion gallons of water. The next stop was made at Edgewater, where the surface plant of the largest mine in the state was shown the visitors. Tuesday's tour of inspection was concluded at the new plant of the American Steel & Wire Co.

Iron and Steel Financial News

Up-to-the-Minute Fact and Comment Collected and Sifted For Busy Readers

La Belle Reports Large Earnings

EARNINGS available for dividends on the common stock of La Belle Iron Works, Steubenville, O., for the year 1916, would have been equal to about 52 per cent on that issue, if the usual charges only had been made and regular dividends of 8 per cent paid on preferred. Net earnings of $6,434,318 were rolled up last year, as compared with $1,281,492 in 1915. The 1916 showing is by far the best the company has ever made. But the company's management pursued a conservative course with regard to dividends, making ample allowance against future exigencies. The management paid up 5 per cent back dividends on preferred and declared an initial payment on common. However, abundant allowances were made to provide against possible cloudy days to come, a total of $1,476,336 being set aside for "accidents, contingencies and depreciation of special equipment", "provision for inventory reserve, adjustment, etc.", and "discount and premium on bonds". These allowances are made this year for the first time. Allowance for depreciation was $500,000, as against $250,000 in 1915. But the surplus for common after these allowances remains considerable, amounting to 32.27 per cent, as compared with 5 per cent last year. The income accounts for 1916 and 1915 compare as follows:

	1916.	1915.
†Net earnings	$6,434,318	$1,281,492
Exhaust and exting.	260,214	253,758
Profits for year	$6,174,104	$1,027,734
Bond interest	209,166	99,860
Surplus	$5,964,938	$927,874
Special provisions	*1,476,336	.....
Balance	$4,488,602	$927,874
Dividends (cash)	1,388,156	396,616
Surp. for year	$3,100,446	$531,258
Previous surplus	3,056,318	2,775,059
Total surplus	$6,156,763	$3,306,318
Approp. for deprec.	500,000	250,000
Net surp. Dec. 31, 1916	$5,656,763	$3,056,318

*Includes provision for accidents, contingencies and depreciation of special equipment, $206,184; provision for inventory reserve, adjustments, etc., $1,000,000; discount and premium on bonds, $270,151.

†After deducting charges for maintenance and repairs to plant of $1,037,900 in 1916 and $665,300 in 1915.

President R. C. Kirk, in his remarks to stockholders, says in part:

"At the time your last annual report was submitted, business conditions seemed to justify the hope that your plants would be profitably operated to capacity, which hope was realized, as the demand became more insistent with each succeeding month, prices increasing to a point beyond previous price records for finished steel products. Business booked at remunerative prices will engage your capacity for months to come, and the outlook can be considered promising."

The company's iron ore mines produced 352,803 gross tons of ore, an increase of 4.4 per cent over the previous year. Its beehive coke properties were operated at capacity during the year, producing 112,986 net tons of coke, a decrease of 12.4 per cent as compared with 1915, owing to the inadequate car supply. The Steubenville coal mine was operated continuously during 1916, producing 165,289 net tons of coal, an increase of 2.6 per cent over the previous year.

La Belle Iron produced more open hearth steel last year than for any similar period in its history. The tonnage produced for the year in gross tons compares with the previous year as follows:

	1916.	1915.
Pig iron	257,623	169,836
Ingots	416,783	327,836
Billets and slabs	350,426	284,089
Finished goods	416,827	376,434

The average number of employes was 3,804, as compared with 3,551 last year; the payroll was $4,033,354, as compared with $3,067,074; the average per employe was $1,060 as compared with $837 in 1915.

Shipments Were Heavy

The aggregate value of shipments for the year was $19,698,155, as compared with $11,352,724 in 1915. The company's outstanding first mortgage 6 per cent gold bonds were called for redemption and the mortgage cancelled, last year.

Bethlehem Annual Report

Net income of the Bethlehem Steel Co. for 1916 was $43,593,968, a gain of $25,831,155 over 1915, according to the annual report just made public. Orders on hand Dec. 31, 1916, aggregated $193,374,248, compared with $175,432,895 on Dec. 31 the year previous. Current assets on Dec. 31 were $86,763,814, while current liabilities were $50,420,468, leaving net working capital of $36,343,346. Recently announced additional financing, however, will give Bethlehem Steel Corporation working capital exceeding $100,000,000.

Total provision by the Bethlehem Steel Co. for repairs and depreciation for 1916 reached $26,848,772, compared with $9,106,671 in 1915. The company in 1916 employed an average of 47,013 workmen, with total salaries and wages of $51,499,773, compared with 22,064 employes and salary and wage expenditures of $21,800,664 in 1915. These figures do not include men employed in the Cuban and Chilean mines.

Earnings Compared

The Bethlehem Steel earnings for 1916 compare thus:

	1916.	1915.	1914.
Total inc.	†$61,717,309	$24,821,408	$9,649,668
Int. on bds. & notes of sub cos.	3,772,556	2,342,596	2,212,374
Deprec.	14,350,786	4,377,000	1,500,000
Exting.	‡.....	339,000	347,273
Balance	$43,593,968	$17,762,812	$5,590,020
Prfd. div.	1,043,560	1,043,560	745,400
Balance	*$42,550,408	$16,719,252	$4,844,620
Com. div.	4,458,600	.....	.....
Surplus	$38,091,808	$16,719,252	$4,844,620
Prev. surp.	6,278,390	2,059,138	2,214,518
Total surp.	$44,370,198	$18,778,390	$7,059,138
Approp.	$35,000,000	12,500,000	5,000,000
P. & L. sur.	$9,370,198	$6,278,390	$2,059,138

*Equal to 286.30 per cent on $14,862,000

common stock, compared with 112.49 per cent earned on same stock in 1915.

†After deducting expenditures for ordinary and extraordinary repairs, taxes, etc.

‡Provision for extinguishment of mining investments, etc.

§Appropriated for and invested in additions to property and working capital.

President Charles M. Schwab, in his remarks to stockholders, points out a number of interesting facts. He says the larger depreciation increase over what had been provided in previous years and what will be necessary in normal times, has been made in order to write off during the life of the contracts machinery installed for war orders. Thus the balance sheet of the corporation may be conservative even if it be found later impossible to utilize such machinery for other purposes. President Schwab calls attention to the recent large purchases of various manufacturing properties such as the Pennsylvania Steel, Maryland Steel, American Iron & Steel Mfg. and certain properties of the Lackawanna Steel Co. located at Lebanon, Pa. The purchase of the American Iron & Steel Mfg. Co.'s properties was made at $6,600,000, paid in bonds of the newly organized subsidiary Penn Mary Steel Co. secured by property mortgage on the acquired assets. Purchase also of the Lehigh Coal Co., involving a large by-product plant located near the works of the Bethlehem Steel Co. and from which it derived its principal supply of coke, is referred to, and the report says contract for purchase contemplates the transfer of the properties to a new company organized for the purpose and payment of the purchase price.

Stocks Steady But Inactive

Despite the gravity of the international situation, and the shadow of a country-wide railroad strike overhanging the market, iron and steel stocks reflected little anxiety among speculators. In this respect they resembled other classes of securities the past week. Wall street could not bring itself to believe that such a catastrophe as a general strike would not be averted. But, though prices were well maintained, activity was not pronounced; phrased market-wise "public participation was at low ebb". Following is a table showing quotations on a number of iron, steel and industrial stocks at the close of the New York stock exchange, March 17, and net changes for the preceding week:

	Close Mar. 17.	Net chg.
American Can	46⅝	+ ⅛
American Can, prfd.	106⅝	— ⅛
American Car & Fdy.	67	— ⅜
American Locomotive	71⅛	—1⅜
American Locomotive, prfd.	105⅝	+1⅝
American Steel Foundries	61⅜	—2⅛
Baldwin Locomotive	53⅝	— ⅛
Baldwin Locomotive, prfd.	102	+1
Bethlehem Steel	132	+2
Colorado Fuel & Iron	48	— ¼
Continental Can	88	—2½
Crucible Steel	66¼	— ⅜
Crucible Steel, prfd.	114	+1
General Electric	165	+ ⅝
Gulf States Steel	128½	+5
Gulf States Steel, 1st prfd.	107	.....
International Harv. Corp.	78¼	+2¼
Lackawanna Steel	83½	— ⅜
Nat'l Enamel'g & Stmp. Co.	34¼	—1⅜
Pressed Steel Car	78⅜	—2⅛
Pressed Steel Car, prfd.	104⅞	— ⅛
Pullman Palace Car	161	+ ⅜
Republic Iron & Steel	80⅞	—1⅛
Republic Iron & Steel, prfd.	104⅜	+ ⅛
U. S. C. I. P. & Fdy. Co.	20	—1
United States Steel	112⅜	— ¼
United States Steel, prfd.	117⅝	— ⅜
Westinghouse Mfg.	52	+ ⅛

Maximum quotations on a number of steel and industrial stocks, not quoted on the New York stock exchange, at the close March 16 and March 9, follow:

	Mar. 16.	Mar. 9.
American Radiator	300	440
American Ship Building	64	62
Cambria Steel	105	...
Chicago Pneumatic Tool	69	69
LaBelle Iron Works	88	86
Lake Superior Corp'n	24	22⅛
Stewart-Warner Speed. Co.	82½	85¼
Warwick Iron & Steel Co.	9½	9¼
Westinghouse Air Brake	149½	150
Westingh'se Elec. & Mfg. Co.	52⅜	50¾

Dividend Passed

Toronto, March 19.—The Eastern Car Co., Ltd., a subsidiary of the Nova Scotia Steel & Coal Co., has discontinued dividend payments on its preferred stock, owing to the unfavorable returns from last year's business. There was an operating loss of $148,496 for the 13 months ending Dec. 31, and a total deficit of $304,554. The preferred dividend for the year of $48,750 was charged up to the balance at the credit of the profit and loss account, the statement as of Dec. 31, showing a deficit of $103,148 as against a credit balance of $250,155 in profit and loss 13 months before. The disappointing results of the year's business are attributed to labor shortage, deferred deliveries of materials and unforeseen difficulties in connection with the manufacture and delivery of foreign cars. The company has orders sufficient to keep the plant in operation during the current year.

At a meeting of the Cleveland section of the American Institute of Electrical Engineers, March 19, R. H. Rogers, of the General Electric Co., Schenectady, N. Y., read a paper on "Electric Freight Handling in Terminals". The lecture was illustrated by a number of interesting slides and was discussed by several engineers.

Canada Gets Busy

Plans Construction of Large Number of Ships—Plants to be Built

Toronto, March 19.— The imperial munitions board at Ottawa, acting on behalf of the British government, has arranged for the construction of vessels on a large scale at Canadian plants already in operation, and others which will shortly be established. J. W. Norcross, vice president and managing director of the Canada Steamship Lines, Ltd., has been appointed director of ship building in Canada, with full charge of the undertaking and power to organize a staff and place contracts. Orders to the amount of $25,000,000 have already been placed, among the companies embraced in the plan being the Canadian Vickers, Montreal; Canada Steamship Co.; Polson Iron Works and Thor Works, Toronto; Collingwood Ship Building Co.; Port Arthur Graving Dock & Ship Building Co., and the ship building companies at Vancouver and Victoria, B. C. Ships under construction by the Canadian Vickers Co., at Montreal, for Norway, have been taken over, as have also three steel vessels in course of construction by the Nova Scotia Steel & Coal Co., at New Glasgow. It is understood that orders will be limited only by the capacity of the Canadian yards to fill them.

Mesabi Range Royalties

In a communication from Thomas S. McClure, Minneapolis, Minn., our attention is called to the following quotation on iron ore royalties from "Hurd's Iron Ore Manual", compiled by Rukard Hurd, of the Minnesota tax commission:

"Royalty is paid by the operator and depends upon the terms of the lease; there is a wide range in rates. The average estimate of old range royalties is 38 cents, although many old leases fall as low as 10 and 15 cents. The Vermilion royalties are based on old leases and are estimated at 33 cents. Old leases on the Mesabi range call for 15 and 25 cents, but the newer leases with very largely increased royalties, and a tendency to excess, raise the present average estimate to 50 cents."

This quotation is presented to amplify the figures regarding iron ore royalties given on page 380 of the Feb. 8 issue of *The Iron Trade Review.*

MEN OF THE IRON TRADE

Who they are **Where they are** **What they are doing**

FRANCIS B. DUTTON, recently associated with the American Grondal Co., New York City, will have charge of all the technical work connected with the wet magnetic separators and briquetting kilns manufactured by this company. Mr. Dutton was formerly general manager of the Lebanon plant of the Bethlehem Steel Co. He has had considerable experience in magnetic concentration operations.

C. H. Witter, of the Southwark Foundry & Machine Co., Philadelphia, recently returned to this country from a trip to Italy.

G. W. Little, superintendent of the Bucyrus plant of the Ohio Steel Foundry Co., has tendered his resignation to take effect April 1.

Charles F. McBride Sr., solicitor in the Pittsburgh office of the Rock Island railroad, has resigned to become identified with the Sharon Steel Hoop Co., Sharon, Pa.

J. E. Jackson has been appointed New York representative of the Rome Brass & Copper Co. with office at 277 Broadway. He succeeds C. D. Cooper, who has been in ill health for the past two years.

John A. Leonard, business manager of the No. 1 plant of the Crane Co., Bridgeport, Conn., is said to be slated for the assistant managership of the Crane interests in Bridgeport, vacated by C. V. Barrington.

The Universal Portland Cement Co., Chicago, announces the appointment of P. D. Van Vliet as publicity manager. Mr. Van Vliet entered the publicity bureau of the Universal company in 1910.

Charles P. King, formerly sales agent at Atlanta, Ga., for the American Iron & Steel Mfg. Co., which recently passed into the control of the Bethlehem Steel Co., has been appointed sales agent at Atlanta for the latter concern.

"Important Features Relating to the Design and Improvement of City Streets" was the subject of a paper presented March 20 by N. S. Sprague, chief engineer, bureau of engineers, department of public works, city of Pittsburgh, before the Engineers' Society of Western Pennsylvania.

Walter H. Hart, mechanical superintendent of the Stanley Works, New Britain, Conn., has been promoted to superintendent of manufacture. Cedric Powers, who has been assistant to Mr. Hart, has been advanced to the position of mechanical superintendent.

W. Sloane Accles, a representative of the Niles-Bement-Pond Co., who left Hartford, Conn., two weeks ago and sailed for Spain on the Alfonse XII, has arrived there safely, according to a cablegram received by the Pratt & Whitney Co., Hartford.

John W. Bray, who has represented the Bullard Machine Tool Co. in New York and New England territory for a number of years, has been appointed sales manager of that company. His headquarters will be at the company's main office, in Bridgeport, Conn.

A. R. Cheney, engineering department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., spoke before the Pittsburgh section of the American Institute of Electrical Engineers, March 13, about "Power Limiting Reactances and Service Protection."

Metal Trades Elects

The Worcester branch, National Metal Trades Association, at its sixteenth annual meeting in Worcester, Mass., March 16, elected the following officers for the ensuing year: Jerome R. George, Worcester, president; W. H. Gates, Worcester, vice president; A. W. Beaman, Worcester, treasurer; H. F. Brandes, Fitchburg, Mass., F. A. Ball, Athol, Mass., A. Sherman Miller Jr., Worcester; Leon E. Young, Southbridge, Mass.; and Herbert L. Flather, Nashua, N. H., members of the executive board for two years. The latter will re-elect Donald Tulloch secretary.

Dayton Coal & Iron Sold

The Dayton Coal & Iron Co., Dayton, Tenn., has been sold to Francis C. Carey and associates, of Minneapolis, Minn., subject to the formal confirmation of the bankruptcy court, which will meet March 26. All known objections to the sale have been withdrawn. The buyers are to pay $400,000 for the plant and properties, exclusive of pig iron and coal stocks. The buyers also agree to waive their claim for deeds until they make $100,000 on improvements to the Dayton plant. The terms of the sale specify payment of $50,000 upon formal confirmation of the sale and $70,000 annually thereafter. Scottish banks, which are holders of $500,000 of the company's bonds, have cabled their approval of the sale. The buyers want to take possession by April 1.

The Dayton Coal & Iron Co. was adjudged a bankrupt in December, 1915, as a sequel to the failure of James Watson & Co., Glasgow, Scotland, in June, 1913. It has two blast furnaces at Dayton, Tenn., with a capacity of 100,000 tons a year of foundry and forge iron. They were last active in 1913. The sale, if finally confirmed, is a new chapter in a long series of suits and disputes involving this property.

Buyer Pays Tax

New York, March 20.—Due to the belief in the metal trade that the British government shortly will impose an export tax on tin shipped from Great Britain or her possessions, the board of managers of the New York metal exchange has rendered a decision that in case such a tax is levied the form of the present "New York tin contract" provides that it would have to be paid by the buyer.

Directors Reduced

At the annual meeting of the stockholders of the Lackawanna Steel Co. held March 14 at the company's offices at Lackawanna, N. Y., the number of directors was reduced from 21 to 15, and the annual classes from seven to five each. This was accomplished by the retirement of Richard F. Howe, Hamilton F. Kean, Percy R. Pyne, Henry R. Taylor, F. F. Graham, E. J. Hancy and W. J. Wilson, and by the addition to the board of H. G. Dalton, of Pickands, Mather & Co., for the term expiring 1918. John Henry Hammond was elected for the term expiring 1918, and George W. Burleigh, E. A. S. Clarke, Edwin S. Marston, Ogden L. Mills and C. H. McCullough Jr., each for a term of three years expiring 1920. Shares to the number of 231,000 were represented in person or by proxy at the meeting. C. H. McCullough Jr., vice president of the company, presided.

What the Government is Doing

Business News from the Nation's Capital by the Resident Staff Correspondent of The Iron Trade Review

Huge Naval Contracts Are Let

Bureau of *The Iron Trade Review*,
708 Metropolitan Bank Bldg.,

Washington, March 20.—In an effort to expedite construction of war vessels, the navy department has adopted a policy calling for as wide a distribution as possible of contracts with ship builders, and manufacturers of steel, machinery, boilers and other materials. This plan was agreed upon at a conference which navy department heads held with ship builders last Thursday, when contracts for four battle cruisers and six scout cruisers were awarded. The fifth battle cruiser will be built at the Philadelphia navy yard. The contracts, involving approximately $112,000,000, the largest award of the kind ever made at one time by any nation, will be followed soon by others for the remaining ships which have been authorized by the new naval act.

The four battle cruisers to be constructed in private yards were distributed as follows, the builders taking the work upon a basis of 10 per cent net profit:

Two to the Newport News Ship Building & Dry Dock Co., Newport News, Va.; one to the Fore River Ship Building Corporation, Quincy, Mass., and one to the New York Ship Building Co., Camden, N. J.

While the builders do not know how long it will require them to build this new and powerful type of war craft, they have told Secretary Daniels that they hope to complete them in three years. The limit of cost on these for hull and machinery is $19,000,000 each.

Awards for scout cruisers were made as follows:

Two to William Cramp & Sons Ship & Engine Building Co., Philadelphia, one in 30 months and one in 32 months, at $5,950,000 each; two to the Union Iron Works, San Francisco, Cal., no delivery period stipulated, $6,000,000 each, the limit of cost; two to the Seattle Construction & Dry Dock Co., Seattle, Wash., one in 30 months, $5,975,000; time of delivery of other not announced.

The Seattle company had bid on only one of the scout cruisers when tenders were opened last week, having taken a contract for one last August. It was persuaded, however, to take a contract for the third vessel of this type.

The ship builders have agreed to keep at least 70 per cent of their working force on naval construction and those supplying material for the vessels will be asked to keep as large a force as possible on the production of the necessary supplies. The overhead costs in connection with the building of battle cruisers are to be determined by a naval board. It is understood that items entering into overhead charges have been agreed upon. The government will also stand for half of the cost of enlarging and building new ways at private yards for building these vessels. This work will have to be done at the Fore River and Newport News yards, as well as at the Philadelphia navy yard, but not at the New York Ship Building plant.

Three Battleships to be Placed

Of the authorized building program there remain three battleships, 38 submarines and 15 torpedo boat destroyers. Secretary Daniels said that it probably would be necessary for the navy yards to take two of the battleships, and a large number of the submarines in order not to overburden the private yards. At least $6,000,000 will have to be spent on getting the Philadelphia yard prepared for forthcoming work, and as much more for other navy yards. The department did not make any scout cruiser awards to the Fore River yard because it is relying upon it to take the greater portion of the torpedo boat destroyers and probably a number of submarines.

Awards for armor for the four battle cruisers were made upon the basis of bids submitted last August, action on which was withheld by Secretary Daniels pending the letting of contracts for the cruisers themselves. Each cruiser will call for approximately the following armor tonnage: Class A (face hardened armor plate), 3,043 tons; A-2 (turret), 168 tons; Class B (special treatment plates), 150 tons; Class C-1 (bolts and nuts), 100 tons; Class C-2 (bronze tap bolts), 5 tons. Armor contracts for two cruisers went to the Bethlehem Steel Co., and for one each to the Carnegie Steel Co., and the Midvale Steel & Ordnance Co. The bids of each company was as follows:

	A-1	A-2	B	C-1	C-2
Bethlehem ..	$435	$485	$466	*$395	§$785
Midvale	440	496	466	†385	....
Carnegie ...	425	486	460	....	....
Pittsburgh Screw & Bolt.	...	...	...	‡448	¶2,240

*57.4 tons; §2.6 tons; †30 tons; ‡346 tons; ¶13.2 tons.

Bids for armor for the battle cruiser to be built at the Philadelphia navy yard will be opened during the first week in April.

Arguments Are Ended

Washington, March 20.—It would be impossible for the United States Steel Corporation to exclude competitors, monopolize prices, or restrain trade, Attorney Charles A. Severance told the Supreme Court in closing arguments on behalf of the Corporation last week in the suit of the government to dissolve the Corporation. The arguments came to an end Wednesday afternoon, when Solicitor General John William Davis of the department of justice said the Corporation should be compelled to release its holdings of its constituent organization. Then, he urged, further competition should be restored, and the Corporation should readjust itself so that there would arise a sufficient number of fully integrated units to guarantee efficiency, with none of the units having power to restrain or monopolize trade.

At some length Mr. Severance quoted statistics to show how much greater has been the percentage of growth of its competitors than has been that of the Corporation. He further pointed out that since the Corporation was organized in 1901 the price trend has been downward, competition has been keen, and insisted it would be impossible for the Corporation to control prices. Cutting of prices in one product, he said, would be followed by similar action with regard to all

other products until the entire market would break down. The market, he said, could not be "localized", and he said it would be disastrous for the Corporation or any other company to attempt a trade war.

Attorney David A. Reed, in his argument for the Corporation, said the proportion of the production of the Corporation, never preponderating, has been gradually declining until in 1915 it was only 44.5 per cent, including exports. Eliminating them, he said the proportion was further reduced to 40.9 per cent. Prices, he explained, had gradually fallen, and were $8 per ton less in October, 1911, when the suit was instituted, than they were when the Corporation was organized. These points were brought out to show the Corporation never restrained trade or eliminated competion.

Tariff Board Under Fire

Washington, March 20.—Nominations sent to the senate last week by President Wilson for the six members of the tariff commission have been vigorcusly criticized. Republicans of the upper branch of congress are unsparing in their condemnation of the selections and assert that their party is not represented in the list, although the White House in giving out a sketch of the men named classed two of them, William S. Culbertson, Emporia, Kan., and Edward P. Costigan, Denver Colo., as Republicans. It is claimed that every one of them voted for Mr. Wilson at the presidential election of last November, and that Mr. Culbertson and Mr. Costigan are progressives. Because of his alleged disregard of their party, the Republican senators maintain that the President has violated the spirit, if not the letter, of the law creating the commission, which provides that not more than three of its members shall belong to the same political party. An attempt will be made by Senator Simmons, chairman of the committee on finance, to have all of the names confirmed at the extra session of congress called for April 16.

In addition to the two men already named, the members selected by the President include Prof. Frank William Taussig, of Harvard University, proposed for chairmanship of the board; Daniel Calhoun Roper, McCall, South Carolina, proposed for the 10-year term; David J. Lewis, Cumberland, Md., proposed for the eight-year term; and William Kent, Kentfield, Cal., proposed for the six-year term. Mr. Culbertson was proposed for the four-year term and Mr. Costigan for the two-year term. The term of the successors of these nominees, if they are confirmed, will be twelve years. Those opposing the nominations state all of the men are free traders, with the exception of Mr. Culbertson, and he is classed as a "mild protectionist". Mr. Culbertson at present is special counsel for the federal trade commission. It has been generally conceded that he did splendid work in connection with the recent investigation of the commission regarding commercial conditions in foreign countries upon which was based a report on export trade. Mr. Culbertson's field of activities in this investigation was in South America. He was connected with the former tariff board and wrote the first volume of its report, on the wool schedule. In 1913 he acted as a tariff expert for the senate committee on finance during the consideration of the Underwood-Simmons act. He is a graduate of Emporia college and of Harvard university.

Professor Taussig, the only one of the members who has anything like a national reputation, is a political economist and is the author of a tariff history of the United States. Politically, he is classed as an independent, but he is known theoretically as a free trader and has always been considered a Democrat of the Grover Cleveland school of thought. He is 57 years old and received the degrees of A. B. at Harvard university in 1879; Ph. D. and A. M. in 1883; LL. B., 1886, and Litt. D., Brown university, 1914. He was instructor of political economy at Harvard university from 1882 to 1886; assistant professor from 1886 to 1892; professor from 1892 to 1901, and has been Henry Lee professor at Harvard since 1901. He is a fellow of the American Academy of Arts and Sciences, and was president of the American Economic Association from 1904 to 1905. In addition to "The Tariff History of the United States", he is also author of "The Silver Situation in the United States"; "Wages and Capital"; "Principles of Economics"; "Some Phases of the Tariff Question"; "Inventors and Money Makers", and is editor of the *Quarterly Journal of Economics*. He has obtained leave of absence from Harvard university until 1918.

Mr. Lewis is a "lame duck". He is a former representative and was defeated in the recent election for senator from Maryland. While he is known as a Democrat, he is also prominently known as a man with many socialistic views. He is 47 years old. Mr. Kent, a millionaire, came to congress six years ago as a Republican, and was re-elected to the last two congresses as an independent, and was not a candidate for re-election. He managed the Wilson campaign in California as the head of the Wilson independent league and is said to have made liberal financial contributions to the Wilson fund. His name was sent to the senate as an independent. Mr. Roper, a Democrat, 50 years old, was a clerk of the house committee on ways and means when the Underwood-Simmons act was prepared by that committee. He was next made first assistant postmaster general, but resigned that position last fall and took up special work for the Democratic national committee. Mr. Costigan, 43 years old, is a lawyer, and originally was a Republican, but in 1912 and again in 1914 was the progressive candidate for governor of Colorado, and was one of the founders of that party in his state.

Readjusts Coal Rate

Washington, March 20. — Readjustment of rates on coal from points in the Reynoldsville district of Pennsylvania served by the Buffalo & Susquehanna railroad to Buffalo, Lackawanna and Harriet, N. Y., and other points in the so-called Buffalo-Black Rock switching district was ordered by the interstate commerce commission in a decision handed down last Thursday. The rates were found to be unduly prejudicial to the extent that the group rate from points of origin to the territory of destination exceeds 80 per cent of the rate contemporaneously maintained on coke from Tyler and Sykes, Pa., on the Buffalo & Susquehanna to Lackawanna. This coke rate is $1.05. The new coal rate, therefore, will be 84c per net ton. The complainants in the case were the Buffalo Union Furnace Co., and the Wickwire Steel Co., Buffalo and Harriet, respectively. They challenged as unjustly discriminatory the relationship of rates to Buffalo, Harriet and Lackawanna and other points in the so-called Buffalo-Black Rock switching district on coal and coke from the Reynoldsville district, and also the relationship of rates to the same points of destination on coke from the Reynoldsville and Connellsville districts. Claims of the respective complainants for reparation in the sums of $200,000 and $125,000 were abandoned. The commission, however, refused to prescribe any relationship between coke rates from the two districts, holding that it had considered rates on coke from the Connellsville district in a number of cases and held that a rate of $1.85 per ton to the Buffalo district was reasonable.

Obituaries

CHARLES A. VOGT, auditor American Steel & Wire Co., who died at his residence in Cleveland last Thursday, was buried at Chicago, Monday. Funeral services were held at Cleveland Sunday afternoon. He died of pneumonia, having been ill only a few days.

Mr. Vogt's early training was with the Illinois Steel Co., Chicago. He became associated with the American Steel & Wire Co. shortly after its

CHARLES A. VOGT

formation, first as assistant auditor at Chicago, and later going to the general headquarters at Cleveland as auditor. He was also a director of the company, a director of the Equity Savings & Loan Co., Cleveland, and a member of the Cleveland chamber of commerce and other business organizations. His brother, Adolph W. Vogt, is assistant comptroller of the United States Steel Corporation. Mr. Vogt is survived also by his widow, Mrs. Grace Findlay, a daughter of A. I. Findlay, editor of *The Iron Age*, New York, an infant son, Charles A. Jr., and his parents and two sisters in Chicago.

Ruben Miller, at one time head of the Crucible Steel Co. of America, and a prominent industrial and financial leader in western Pennsylvania, died of pneumonia at his home in Pittsburgh, March 14. He was 78 years old. Mr. Miller was a pioneer iron manufacturer of Pittsburgh, where he was born Jan. 31, 1839. His father, Ruben Miller Jr., was engaged in the manufacture of iron products. Mr. Miller, after completing his education at the College of St. James, became an apprentice in the works of Robinson, Minus & Miller, blast furnace builders. Later, he became a mechanical engineer at the Black Diamond Steel Works of Park Bros. & Co., and designed some of the bar and sheet mills of that concern.

In 1885, Mr. Miller and others formed the partnership of Miller, Barr & Parkin, subsequently known as Miller, Metcalf & Parkin, which was merged with the Crescent Steel Co. In 1900, the Crescent company became the principal works of the Crucible Steel Co. of America, of which Mr. Miller became chairman of the board of directors; he retained that position until he retired from active business in 1904.

Mr. Miller organized, and for a number of years was treasurer of the Pittsburgh Bessemer Steel Co., at Homestead, which was sold to Andrew Carnegie. This plant formed the nucleus of the Homestead Steel Works. Mr. Miller was one of the organizers of the Pittsburgh Locomotive & Car Works, of which he was vice president. He took an active interest in the development of oil and gas properties in western Pennsylvania. At one time, he was in charge of the operations of the Pioneer Coal Co. In addition to his many activities in industrial lines, Mr. Miller was a prominent figure in the banking circles of Pittsburgh, serving at different periods as president of the Bank of Pittsburgh, the Merchants & Manufacturers Bank, and as a director of several other banking institutions. He was actively interested in the civic affairs of his native city. He was one of the first to answer the call for volunteers when the Civil War broke out, and was made a lieutenant for gallantry while serving with Knapps Pennsylvania Volunteer Battery.

Ferdinand W. Roebling, treasurer and general manager of the John A. Roebling Sons Co., Trenton, N. J., died at his home in Trenton, March 16, as the result of a general breakdown which had developed from a severe cold contracted a month ago. He was 75 years of age. Mr. Roebling was a son of John A. Roebling, who founded the first wire rope mill in the United States in 1840, and was the designer of the Brooklyn Bridge. When the latter died in 1869 his interrupted work on the Brooklyn Bridge was taken up by his sons, Washington A. and Ferdinand W. Roebling. They carried the construction to completion in 1883. Mr. Roebling was born in Saxonburg, Pa., Feb. 27, 1842. He was educated in the Polytechnic College, Philadelphia,

FERDINAND W. ROEBLING

where he specialized in chemistry. He then entered his father's business. The original Roebling wire rope mill was located at Saxonburg, but was transferred to Trenton in 1848, where in the course of years it was expanded to one of the largest works of its kind in the United States. Mr. Roebling was an officer and director of numerous corporations. He was secretary of the John A. Roebling Sons Co., of New York, president of the Trenton Brass & Machine Co., and an officer or director of the New Jersey Wire Cloth Co., the Otis Elevator Co., A. Leschen & Sons Rope Co., the Mercer Automobile Co. and other industrial, banking and public utility corporations. He was a member of the Union League and the Engineers' Clubs. Karl G. and F. W. Roebling, his sons, and Charles G., Col. Washington A. and Edward, his brothers, survive.

Tool Buying Goes on at High Speed

Westinghouse Closes Many Contracts on Million-Dollar List—Eastern Market Subsides After Strenuous Session—Chicago Dealers Have Hands Full—Big Inquiries in Cleveland

THE Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has begun the distribution of orders for the list of machine tools which it recently put out in connection with the new plant which the company is about to erect at Essington, Pa., for the manufacture of ship and ship-building equipment. This list involves about 200 large tools representing an outlay of more than $1,000,000. Outside of this development the machine tool market is less active than in previous weeks. In some quarters, however, the present situation is considered in some respects similar to the lull before a storm, since the indications are that some large orders are expected to materialize in the next few weeks out of the naval and military requirements of our government. Huge lists of the special mechanical equipment to be installed aboard the warships which last week were placed under contract by the navy department, are beginning to be put out by the prospective builders. It is expected that inquiries for the machine shop equipment to be installed aboard these vessels will come out shortly.

Several of the railroads are in the market for miscellaneous tools. The Chicago, Burlington & Quincy, the Pittsburgh & Shawmut and the Baltimore & Ohio railroads have placed fair-sized requirements during the week. The Midvale Steel & Ordnance Co. has placed an order for a 150-ton ladle crane for its Coatesville plant and for one 10-ton crane for its Nicetown plant. The company still is in the market for three 20-ton cranes for the latter plant. The Consolidated Gas, Electric Light & Power Co., Baltimore, has purchased a 15-ton crane. Day & Zimmerman, Philadelphia, have placed a contract for a 50-ton crane to be installed in the power house of the Erie Lighting Co., Erie, Pa.

Threatened Strike Quiets Pittsburgh

THE Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., whose inquiry for a long list of tools for installation in its new plant at Essington, Pa., has attracted attention in the machine tool trade, has not distributed orders for any of the machine shop equipment, except traveling cranes. Details of the crane order were outlined in the March 15 issue of *The Iron Trade Review*. The Westinghouse company will likely award contracts before the end of this month. The general market for machine tools at Pittsburgh has been quiet this week, because of the threatened strike of railroad employes. This has occupied the center of the stage for several days. Demand for single tools continues heavy. Builders of heavy rolling-mill equipment are entertaining numerous inquiries for export. The Tata Iron Works, Sakchi, India, is reported to have placed a large order for steelworks equipment with the Pennsylvania Engineering Works, New Castle, Pa.

Big Lists in Cleveland

THE Cleveland machine tool market is featured by a heavy demand for single tools. Orders from domestic users embrace a wide line of miscellaneous equipment. No particular type of machine occupies the front rank; all seem to be finding a ready sale. Deliveries are better than has been the case for 30 days. Several large lists which entered the local market recently are still pending. The Firestone Tire & Rubber Co., Akron, is understood to have practically closed for most of its requirements but some tools are yet to be purchased. The United Alloy Steel Corporation, Canton, O., has not yet entirely closed on an inquiry which was recently issued. The White Motor Co., Cleveland, is understood to have entered the local market for a number of machine tools. No detailed list has been issued by the White company but it is stated that this company's requirements are very heavy. The Universal Valveless Motor Co., Factories building, Toledo, expects to enter the market shortly for production equipment. All inquiries to this firm should be addressed to the engineering department.

Dayton Company Dumps Tools

The Platt Iron Works Co., Dayton, O., has placed a large number of machine tools on the market for immediate sale. Some of the machines are new; others have been used slightly. The value of the equipment is estimated at $250,000. The machine tool market is so solid that the dumping of this equipment has had practically no effect. Manufacturers who have had orders on file with builders for three and six months and others who have deferred buying on account of the delivery clause, have been quick to purchase machines so offered.

The New York Central railroad is still buying on the list recently issued. The New York, Chicago & St. Louis railroad, W. P. Dittoe, purchasing agent, Cleveland, has issued a large list of tools which will be purchased immediately. This list is published in full on page 696. An unusually large list issued by John W. Thorne & Co., 14 Wall street and 165 Broadway, New York City, has appeared in the Cleveland market. This list also appears in detail on page 697.

The Ohio Machine Tool Co., Kenton, O., has plans for doubling its present machine shop. A large portion of the new equipment has been placed but the company is still in the market for one 36-inch Fellows gear shaper and one Lucas horizontal precision boring mill. All replies should be addressed to C. C. Swift, secretary and treasurer of the company.

Demand is Brisk and Varied in Chicago Market

MARCH is developing into a heavy month for machine tool dealers in Chicago. Not only are more machines being moved, but present prices bring a large increase in the total of receipts. One dealer says that the average sale, which for years ran about $1,000, now reaches $2,500 or more. Part of this is accounted for by higher prices. Another factor is the tendency to equip even small garage machine shops with more tools than was the rule formerly. This is because it is increasingly difficult to have special work done outside. Some dealers find that shipments from manufacturers are somewhat better and attribute this to embargoes on export which release machines for

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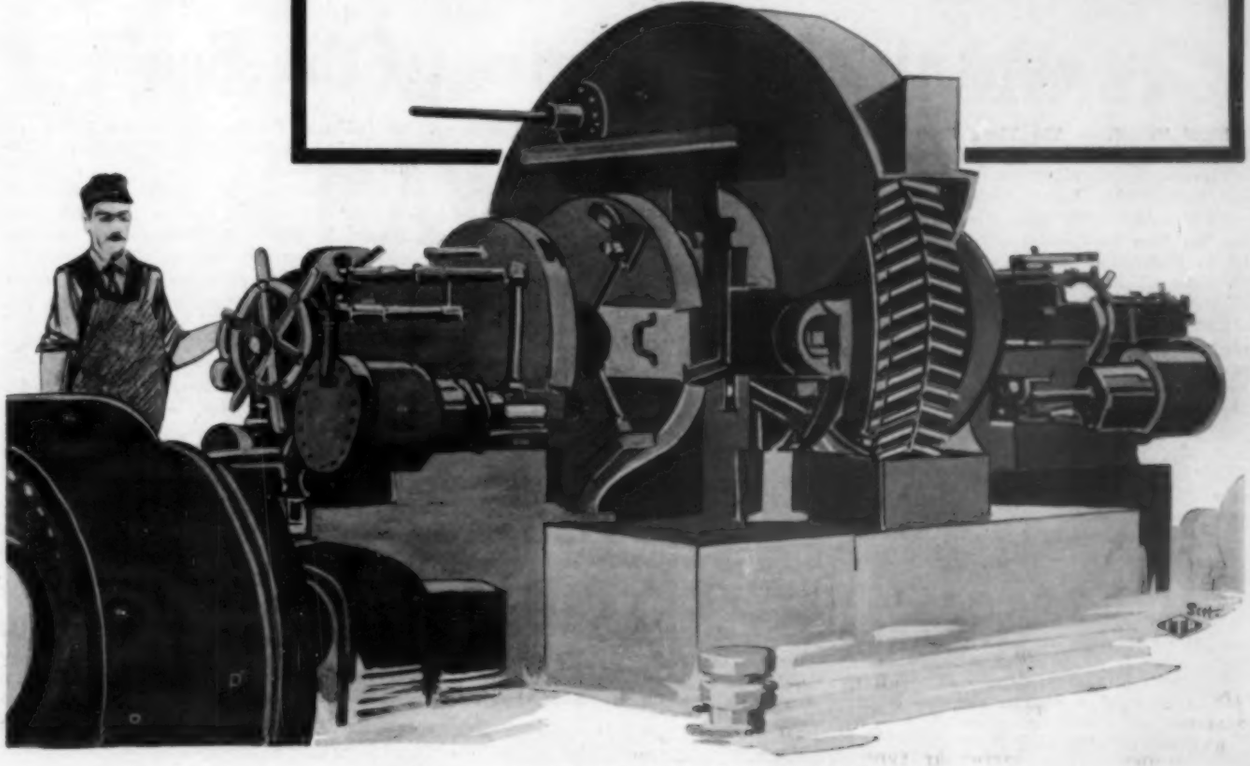
BRANCH OFFICES:

Detroit Office: 326-27-28 Ford Bldg., F. Walter Guibert, District Representative
Cleveland Office: Hickox Bldg., The Hamill-Hickox Co., District Representative
Chicago Office: Room 1511-12 Lytton Bldg., 14 East Jackson Blvd., A. Schaeffer, District Representative
Philadelphia Office: 902 Widener Bldg., Frank Wallace, District Representative
J. E. Dockendorff & Co., 20 Broad St., New York, N. Y., General Export Agents



Say you saw it in THE IRON TRADE REVIEW

domestic orders. An inquiry is current for three large machines for the Rock Island arsenal, where a field-artillery shop is about to be erected and other additions are to be made. The inquiry includes a large open-back inclinable press, combination geared; a solid-back press of the fly-wheel type; and a single-crank, straight-side, geared trimming press, with side shear, weighing about 16,000 pounds. Mining activity in the southwest has produced considerable demand for structural material and equipment. The Yucca-Tungsten Mining Co., Yucca, Ariz., will be in the market shortly for engines, drills, generators, air compressors, and crushers. The Arizona Base Ores Co. will soon need a hoist, compressor, drills, and a 50-ton mill.

Water works and power plants form an important feature of the equipment market in the west. Jacksonville, Ill., is planning to install a centrifugal pump and dynamo. The Illinois-Northern Utilities Co. is preparing to build a 75 x 100-foot steam pumping plant at Dixon, Ill. The Montgomery Hydroelectric Co., Montgomery, Ill., has projected a 10,000-kilowatt power plant. Quincy, Ill., is planning to install motor-driven pumps. The Indiana Railway & Light Co., Kokomo, Ind., is enlarging its power plant, and the Indiana Power & Light Co., Edwardsport, Ind., will build a power house, 120 x 150 feet. The Wisconsin Securities Co. is planning a power plant at Manitowoc, Wis., and the Sheboygan Electric Light & Power Co. will rebuild its hydroelectric power plant.

The Illinois Silo & Tractor Co., Bloomington, Ill., is building an addition 100 x 200 feet. Libby, McNeill & Libby, Chicago, will build a 6-story plant devoted to the manufacture of lard pails and other sheet-metal work. The Studebaker Corporation has decided to build a forge shop at South Bend in addition to the large foundry already announced. The Northwest Bridge & Iron Co., Milwaukee, will build a fabricating shop and will need equipment including shears, rolls and punches. The Federal Cartridge Co., Anoka, Minn., will build a die-making machine shop and power plant. The Atlas-Imperial Gas Engine Co., Oakland, Cal., will build an addition to its erecting shop and will need a 5-ton and a 40-ton crane. The Kentucky Solvay Co. has announced the building of a by-product coke plant at Ironton, Ohio.

Westinghouse Buying Booms Cincinnati Market

NEW YORK, Pittsburgh and Cincinnati machinery circles have been stirred by the heavy buying of the Westinghouse Electric & Mfg. Co. A number of heavy machines have been contracted for and many orders have been placed for lathes, planers, milling machines and radial drills. It has been conservatively estimated that at least a quarter of a million dollars have been spent in Cincinnati for equipment and the huge list, recently issued, is far from closed. The Firestone Tire & Rubber Co., Akron, has entered the Cincinnati market for some equipment. Power plants are buying freely. The city of Plymouth, O., will shortly erect a waterworks plant for which equipment will be purchased.

New Construction and Equipment

What it is **Where it is** **Who's doing it**

From the Alleghenies to the Sea

NEW YORK. — The Three Point Truck Corporation has been incorporated with $300,000 capital by O. Schulthies, G. S. Freeman and R. S. Banks, 51 East Forty-second street.

NEW YORK.—The Mott Sand Blast Mfg. Co. has been incorporated with $35,000 capital to manufacture foundry equipment by J. H. Keim, F. S. Crosley and A. B. Brenner, 25 Broad street.

NEW YORK.—The Union Technical Corporation has been organized with $25,000 to manufacture motors, vehicles and machinery by H. B. Jackson, J. L. Rosenberg and F. H. Martin, Grand Central terminal.

NEW YORK.—Chile Exploration Co., 120 Broadway, has let a contract to Wharton, Green Co., 22 William street, for the erection of a 1 and 2-story, 40 x 112-foot electrical experimental building.

NEW YORK. — Metal Roofing Materials Co., 203 East 135th street, is about to erect a 5-story, 30 x 90-foot plant addition.

NEW YORK.—C. W. Leavitt & Co., Cortlandt building, are in the market for four sets of air receivers for accumulators. Each accumulator is to be fitted with 25 tubes, valves, etc., to have a capacity of 500 liters and is to stand a working pressure of 200 kilograms per square centimeter.

BAYONNE, N. J.—Tidewater Oil Co. will build a 1-story, 100 x 200-foot addition to its oil refinery at Constable Hook.

EAST ORANGE, N. J.—General Electric Co. has let a contract for the erection of a 4-story, 93 x 152-foot plant here with two 2-story wings, each 28 x 59 feet.

ELIZABETH, N. J.—Singer Mfg. Co. has let a contract for the erection of a 1-story, 100 x 200-foot addition.

ELIZABETH, N. J.—Tisch Machine, Tool & Die works has been incorporated to manufacture dyes, tools and other machinery, with $50,000 capital by Amanda Tisch, Louis Tisha, George C. Tisch, Elizabeth.

NEWARK, N. J.—Butterworth-Judson Co. will erect a boiler house, first aid station and mixing building.

NEWARK, N. J.—Max Damm, New York, will erect a manufacturing plant at St. Francis and Komorn streets to cost $60,000. Building will be 100 x 100 and three stories.

NEWARK, N. J.—Neuman Hardware Co., 9 St. Francis street, plans to build an addition to cost about $100,000.

NEWARK, N. J.—Elizabethtown Smelting Co. has been granted a permit to erect a 1-story brick store house at 86-92 Frankfort street.

NEWARK, N. J.—Trautz Refining Co. has let a contract for the erection of a 1-story, 50 x 84-foot refinery and garage building at 10 Delancey street.

PLAINFIELD, N. J.—Niles-Bement-Pond Co., manufacturers of machine tools, has plans drawn by Harris & Richards for concrete building, 75 x 288 feet.

CHARLEROI, PA.—The borough of Charleroi plans to erect a 3-story auditorium and municipal building, 60 x 100 feet, to cost $30,000. J. C. Brenton, 722 Washington avenue, is preparing the plans.

CHESTER, PA.—Harper Mfg. Co., Jas. H. Harper, is about to erect a 2-story, 38 x 110-foot machine shop.

CHESTER, PA.—Sun Ship Building Co. has completed plans for the erection of a 1-story, 50 x 200-foot carpenter shop.

COLUMBIA, PA. — The Herr & Co.'s hardware building was damaged to the extent of $120,000 recently.

DU BOIS, PA.—The Rochester & Pittsburgh Iron Co. plant at Soldier, Pa., suffered $40,000 damage by fire recently.

EMAUS, PA.—Pennypacker Co. is about to erect a 1-story, 94 x 551-foot foundry addition.

ERIE, PA.—The city council will appropriate $850,000 to build a flood prevention tube.

ERIE, PA.—The Penn Art Steel Works

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High in Manganese

Very Desirable for Making Basic Iron

Complete Analysis

	Dried 212°	Natural
Iron	58.35	50.2451
Phosphorus	.065	.05597
Silica	6.03	5.1924
Manganese	1.00	.8611
Alumina	3.40	2.9277
Lime	.16	.1377
Magnesia	.12	.1033
Sulphur	.031	.0266
Volatile Matter	5.74	4.9427
Moisture	13.89	

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The Tod-Stambaugh Company
Perry-Payne Building Cleveland, Ohio

has been incorporated with $25,000 capital by M. J. Schabacker, E. H. Derry and Landis E. Isaac, all of Erie, Pa.

ERIE, PA.—The Erie Tempered Copper Products Co. has been incorporated with $250,000 capital by F. X. Bowman, A. A. Whiteman and C. H. Horne, all of Erie.

HAZELTON, PA.—The Pennsylvania railroad has awarded John H. Erohm, Buttonwood & Laurel streets, a contract to erect a freight station, 38 x 160 feet, to cost $20,000.

LIGONIER, PA.—The National Bank of Ligonier plans to erect a 2-story bank, 36 x 50 feet, to cost $20,000. Eugene Schoen, 106 West Nineteenth street, New York, is preparing the plans.

PHILADELPHIA. — American Engineering Co., Aramingo and Cumberland streets, has let a contract for the erection of three shop buildings.

PHILADELPHIA.—Frankford arsenal has let a contract for the erection of two artillery case shop additions, two and four stories, and 49 x 199 and 30 x 63 feet, respectively.

PHILADELPHIA. — Keystone Supply & Mfg. Co. has let a contract for the erection of a 3-story, 40 x 100-foot addition.

READING, PA.—The Carpenter Steel Co. plans to construct a bridge over the Schuylkill river at Riverside.

SHARPSBURG, PA. — The Universal Bronze Co. has been incorporated with $20,000 capital by G. H. McFetridge, Aspinwall; H. D. Piel, Sharpesburg; W. F. Meyers, Ross W. Flock and D. L. McCandless, Butler, Pa.

YORK, PA.—York Mfg. Co., machinery, is about to erect a 1-story, 20 x 200-foot addition.

Activities in the Central States

BALDWINSVILLE, N. Y.—The board of education plans to erect a school, to cost $40,000.

BROOKLYN.—The Walsh Patent Horseshoe Co. has been incorporated with $10,000 capital to manufacture horseshoes by J. T. Oates, E. Halabi and G. J. Walsh, 87 Georgia avenue.

BUFFALO.—The Dowers Mfg. Co., 1300 Niagara street, plans to erect an addition to its machine shop. Colson & Dunson, 31 Dun building, are preparing the plans.

BUFFALO.—The E. H. Crawford Co. has been incorporated with $30,000 capital to manufacture asbestos goods and insulating material by F. A. Dorsett, E. H. and H. H. Crawford, 357 Box avenue.

BUFFALO. — The Empire State Auto-Trailer Co. has been organized with $50,000 capital to manufacture motors and vehicles by J. Kascubowaski, F. Tucker and C. B. Rowell.

MILBROOK, N. Y.—The Phanstiehl Co. has been incorporated with $400,000 capital to manufacture mining and milling machinery by H. S. Gould, A. L. Swartz and J. N. Frank, 76 West Monroe street, Chicago.

ROME, N. Y.—The Rome Mfg. Co. plans to erect a 2-story factory, 42 x 310 feet. F. W. Kirkland, 103 West Dominick street, is preparing the plans.

SYRACUSE, N. Y.—The Standard Oil Co. of New York, plans to erect a manufacturing plant, boiler house and office building, to cost $82,000.

SYRACUSE, N. Y.—Continental Can Co. has completed plans for a 2-story, 34 x 36 x 70-foot machine shop.

TROY, N. Y.—Fritz Helmbold, 120 Fourth street, plans to erect a 2-story storehouse.

PITTSBURGH. — The Service Corporation has been incorporated with $10,000 capital to manufacture hoisting jacks; by R. A. Foley, Carrick; A. J. Joyce, Ingram; J. R. Murphy, Crafton, Pa.

PITTSBURGH. — The Holliday Chemical Co. has been incorporated with $25,000 capital by C. E. Willock, W. S. Land, Edgewood; Karl J. Holliday, Pittsburgh.

PITTSBURGH. — The McKenna Brass & Mfg. Co. has been incorporated with $400,000 capital by T. Morris McKenna, C. H. McKenna and T. S. McKenna, all of Pittsburgh.

PITTSBURGH. — The Knox Pressed & Welded Steel Co. has awarded a contract for an extension to its plant at Wheatland, which will practically double its facilities.

PITTSBURGH. — Samuel Bingham's Sons' Mfg. Co. has been incorporated with $10,000 capital to manufacture printing presses; by William H. Bingham, Charles F. Beech, D. J. Smith, Pittsburgh; William T. Hodge, Chicago.

ASHLAND, O.—The Ashland Products Co., recently incorporated with $100,000 capital, has awarded the contract for 2-story, 42 x 150-foot plant to M. H. Morr.

Enters Market

The New York, Chicago & St. Louis railroad; W. P. Dittoe, purchasing agent, Cleveland, has issued an inquiry for the following machine tools:

*One 30-inch heavy-duty engine lathe, with 4-jaw chuck and 8-foot bed, motor-driven.
One 30-inch heavy-duty engine lathe, with 4-jaw chuck and 8-foot bed, belt-driven.
One 28-inch heavy-duty engine lathe, with 4-jaw chuck and 10-foot bed, motor-driven.
One 28-inch heavy-duty engine lathe, with 4-jaw chuck and 10-foot bed, belt-driven.
One 24-inch heavy-duty engine lathe, with 4-jaw chuck and 8-foot bed and taper attachment, motor-driven.
One 24-inch heavy-duty engine lathe, with 4-jaw chuck and 8-foot bed and taper attachment, belt-driven.
Two heavy-duty 3-inch turret lathes for bar or chuck work, motor-driven.
Two heavy-duty 3-inch turret lathes for bar or chuck work, belt-driven.
One 36-inch heavy-duty boring mill with one side head and one vertical head, motor-driven.
One 36-inch heavy-duty boring mill with one side head and one vertical head, belt-driven.
Two bolt centering machines, with capacity from 1 to 4 inches, belt-driven. (One to 6 inches if possible.)
Two 6-inch belt-driven hack saws.
Two Gould & Eberhardt, or equivalent, heavy-duty crank shapers, motor-driven.
Two Gould & Eberhardt, or equivalent, heavy-duty crank shapers, belt-driven.
One 24-inch heavy-duty, motor-driven slotter.
Two single spindle speed drills with pedestal to stand on floor, Morse taper socket, belt-driven, 17/32-inch.
One 42-inch heavy-duty, motor-driven planer, two heads on cross rail and one side head, 10-foot planing length.
One heavy-duty, 6-foot arm and universal head motor-driven radial drill.
One heavy-duty, rigid frame, 12-inch throat and No. 5 Morse taper, steel-geared, positive feed, high-speed drill.
Two 84-inch wet guide grinders for guides 10 inches wide, belt-driven.
One combination punch and shear, 48-inch throat at each end to shear 1⅛-inch plates or punch 1¼-inch holes through 1⅛-inch plates, motor-driven.
One 1⅛-inch motor-driven bolt header.
One 4,000-pound steam hammer.
One 42-inch squaring shear.
One circle shear, capacity 3 to 10-inch circle.
One 8-foot cornice brake.
One 1 to 4-inch pipe threading machine with nipple attachment, motor-driven.
One 1 to 4-inch pipe threading machine with nipple attachment, belt-driven.
One 250-pound rapid stroke motor-driven hammer.
One 250-pound rapid stroke belt-driven hammer.
All lathes to have steel gears and positive drive for feed.

ASHLAND, O.—Plans have been prepared for a new plant for the Eagle Rubber Co., 60 x 80 feet, to cost $20,000. Equipment is being purchased.

AKRON, O.—The Akron Foundry Co. has permits for two additions which will cost about $18,000.

BELLEFONTAINE, O.—The city is having plans prepared for a municipal gas plant by engineer W. C. McCracken, Columbus, O.

CANTON, O.—The Cleveland Champion Spring Co., recently merged with the Cleveland Axle Co., plans to make extensive plant extensions.

CANTON, O.—The Wheeling & Lake Erie railroad plans to expend $500,000 in the improvement of its railroad yard here. Considerable track will be laid.

CINCINNATI. — The Buckeye Products Co. will build 4-story building and will rehabilitate its old plant which was damaged by fire recently.

CINCINNATI. — Equipment for the new boiler plant of the Union Distilling Co. is being purchased by Ward Baldwin, architect. The building is 50 x 60 feet.

CINCINNATI. — The Marietta Chair Co. will more than double its manufacturing space of 40,000 square feet. A small amount of wood working equipment will be purchased.

CINCINNATI.—The Edna Brass Works, Hunt street, will build a machine shop, two stories, 100 x 100 feet. Plans are being prepared.

CINCINNATI.—The Ohio Knife Co. will build an addition to its plant in Cumminsville, to be used for storage purposes.

CINCINNATI.—The United States Furnace Co. has been incorporated with $10,000 capital by C. F. and J. W. Johnson and L. Levy.

CLEVELAND. — Bamberger & Reinthall have acquired a $16,500 site on Grand avenue and plan to erect industrial building.

CLEVELAND. — The Cleveland Telephone Co. has acquired site on Guthrie avenue on which it plans to erect branch exchange.

CLEVELAND.—The Cleveland Electric Illuminating Co. has been granted a permit to build a $35,000 substation on East 103rd street.

CLEVELAND.—The L. N. Gross Co. has plans for a $150,000, 126 x 199-foot shirtwaist factory. The National Fireproofing Co. is contractor.

CLEVELAND.—The Lang Body Co. has been incorporated with $500,000 capital by E. J. Lang, J. H. Price, J. A. Alburn and R. F. Edwards.

CLEVELAND.—The Parker Appliance Co. has been incorporated with $100,000 capital by J. L. Vaughan, B. B. West, R. H. Parker and W. T. Mallo.

CLEVELAND. — The National Appliance Co. has been incorporated with $10,000 capi-

tal by Horace Neff, J. F. Goss, F. F. Weishar, T. H. Bremer and R. C. Taylor.

CLEVELAND.—The Gem Specialty & Mfg. Co. has been incorporated with $25,000 capital by G. E. Rudolph, E. G. Northrup, C. W. Carroll, G. B. Lockwood and T. H. Bell.

CLEVELAND.—The Brandt Motor Co. has awarded to the Craig Curtiss Co. the contract for a 2-story, $150,000 sales room and service station.

CLEVELAND.—The Grant Motor Car Co. is having plans prepared by the W. S. Ferguson Co. for a 160 x 682 foot factory. A second building, 160 x 440 feet, will also be built. The total expenditure will amount to about $400,000.

CLEVELAND. — The Permanent Products Co. plans to erect a plant at West Cleveland, O., which with equipment will cost $1,000,000. Architect E. E. Clepper, of Youngstown, is preparing the plans.

CLEVELAND. — The Cleveland Brass & Copper Mills Co. has awarded to the Westinghouse - Church - Kerr Co., New York, the contract for the erection of its proposed plant. The present plans call for a casting building, mill, boiler house, coal storage house and general storage house. H. C. Osborn, of the American Multigraph Co., Cleveland, president of the brass and copper company, says construction will be completed about July 1.

COLUMBUS, O. — The Ramey Mfg. Co. has been incorporated at $50,000 to operate a foundry, by E. J. Ramey, L. S. McKnight, McGee Sweptson, J. A. Sibley, and R. E. Pfeffer.

HAMILTON, O.—The Columbia Machine Tool Co. will erect a $150,000 factory building to be equipped for a general machine jobbing business.

MARIETTA, O.—The Northwestern Chemical Co. has increased its capital from $20,000 to $150,000 and plans to erect two new buildings.

MARION, O.—The Columbus Delaware & Marion Railway Co. is considering the erection of a $90,000 power plant near this city.

MARION, O.—The Interstate Iron & Steel Co. plans improvements which will cost about $70,000. Considerable new machinery will be installed.

MEDINA, O.—The Spencer Metal Products Co. has increased its capital stock from $25,000 to $50,000.

NEW LEXINGTON, O.—The Star Mfg. Co. has increased its capital from $75,000 to $150,000 and plans to erect a plant addition.

SANDUSKY, O.—The Hinde Dauch Paper Co. plans to build a new factory. Contracts will be taken April 1.

TOLEDO, O. — Architects Mills, Rhines, Bellman & Nordhoff have a permit to erect a $100,000, 200 x 500-foot forge shop which will be a subsidiary to the Willys-Overland Co.

TOLEDO, O.—The Elkirk Machine Co., recently incorporated with $20,000 capital, will erect a new factory on Pinewood avenue for the manufacture of special machinery. R. L. Ellery, of the Toledo Drill & Tool Co. will be active in the management of the new company.

TOLEDO, O.—The Central Tool & Machine Co. is building plant to manufacture punch presses. New equipment, according to G. R. Roesch, general manager, will be installed shortly.

TOLEDO, O.—The National Oxygen Co., manufacturer of gas for cutting and welding steel, plans to erect plant in this city.

WILMINGTON, O.—The Wilmington Gas, Light & Coke Co. is preparing to make an addition to its gas plant to cost $25,000.

HUNTINGTON, W. VA. — The Corns-Thomas Engineering & Contracting Co. has been incorporated with $25,000 capital by H. C. Corns and Reba L. Corns, Ironton, O.; C. C. Thomas, Imogene B. Thomas and M. A. Brast of New Martinsville, W. Va.

HUNTINGTON, W. VA. — The Foster-Thornburg Hardware Co. has awarded the Watts, Castle Co., Tenth and Third avenues, a contract to erect a 4-story warehouse, 50 x 200 feet. B. W. Foster, Second avenue and Eleventh street, is president of the company.

HUNTINGTON, W. VA. — B. G. Cain, carriage manufacturer, 316 Sixth street, plans to erect a 2-story light manufacturing building, 60 x 140 feet, to cost $20,000. Meanor & Sweeney, 917 R. & P. building, are preparing the plans.

HUNTINGTON, W. VA. — The Hotel Frederick plans to erect an addition, to cost about $50,000.

Tools Wanted

John W. Thorne & Co., 14 Wall street and 165 Broadway, New York City, have entered the market for the following machines:

Drilling Machines

Ten vertical, fixed head, 25-inch drills.
Five vertical 26-inch adjustable drills.
Two horizontal radial drills, type, Barnes No. 1.
Five 2½-foot radial drills.
Three 3-foot arm radial drills, type, Bickford, No. 3.
Two 4-spindle heavy-duty independent adjustable type drills.
Two 20 to 24-spindle adjustable notch drills.
One hundred sensitive bench drills, ⅛ to ½-inch.

Milling Machines

Two slab millers, one head on cross rail two side heads, clear space from under side of cutter on cross rail to table, 13 inches, table travel, 4 feet minimum.
Five slab millers, two heads on cross rail, no side heads, clear space from under side of cutter to table, 13 inches, table travel, 4 feet.
Eighteen universal type single pulley drive No. 2 millers.
Five plain, horizontal, vertical head, No. 3 millers.
Fifteen plain, horizontal type millers.
Ten plain 28-inch millers.

Grinding Machines

One 6 x 48-inch grinder.
Two No. 60 Heald type grinders.
Two machines for grinding piston rings into cylinders.

Boring Mills

Five vertical 30-inch boring mills.
Two Lucas type No. 31 or 32 boring mills.

Miscellaneous

One helical gear cutter with three sets of tools.
One automatic thread miller, 6 x 14-inch.
One Brown & Sharpe type No. 13 gear cutter.

Lathes

Four power cross-feed spindle bore turret lathes, 25 to 30 mm.
Two power cross feed spindle bore turret lathes, 30 to 35 mm.
Five power cross feed spindle bore turret lathes, 50 mm.
Twenty-four engine lathes with square turret, lead screw either metric or Whitworth, 20-inch swing, 3 feet between centers.
One tool room lathe complete with all relieving attachments, 16-inch swing, 6-foot bed.
Two crankshaft turning lathes, 14-inch swing.
Three automatic thread lathes minimum swing over carriage, 6 inches, 8-foot bed.
Two hundred and fifty precision type bench lathes, 6 to 8-inch swing, 18 to 20 inches between centers, lead screw and flat belt cone drive.
Twenty-five engine lathes, various capacities.

HUNTINGTON, W. VA.—The Huntington Hotel plans to erect a 9-story addition, to cost about $225,000.

WHEELING, W. VA.—T. F. King has awarded the R. R. Kitchen Co., National Bank building, a contract to erect a 2-story commercial garage, 62 x 140 feet, to cost $30,000. Charles W. Bates, National Bank building, is preparing the plans.

WHEELING, W. VA.—W. F. Gray, 133 North Main street, and J. B. Kay & Co., Fourth National Bank building, plan to erect a 6-story theater and office building, 100 x 135 feet, to cost $300,000.

ANDERSON, IND. — The Reynolds Gas Regulator Co. has been incorporated to manufacture regulators, valves, and other devices with $60,000 capital by Jacob C. Groble, C. B. Reynolds, and Miron G. Reynolds.

BRAZIL, IND.—The Brazil Motors Co. has purchased a plant and will equip it to manufacture front gear drive motor trucks.

EDWARDSPORT, IND. — The Indiana Power & Light Co. will build a 1-story power house, 120 x 150 feet. H. L. Clark is president.

ELKHART, IND. — The Automatic Farm Implement Co. has been incorporated to manufacture machinery with $50,000 capital by C. E. Jackson, E. A. Skinner, and John G. Schacht.

GARY, IND.—The Gary Screw & Bolt Co. has increased its capital from $400,000 to $1,000,000.

GOSHEN, IND.—The county commissioners plan to build a bridge over the St. Joe River at Elkhart avenue, to cost about $70,000.

INDIANAPOLIS. — The Universal Motor Truck Co. has been incorporated to manufacture motor vehicles with $30,000 capital by E. Dawson, Z. E. Keller and F. C. Duncan.

INDIANAPOLIS. — The Lawrence Mfg. Co. has been incorporated with $50,000 capital by A. J. Sorenson, Decorah, Ia., et al.

INDIANAPOLIS, IND. — The Fairbanks Morse Electric Mfg. Co. will build a factory, four stories, 113 x 168. Plans are in progress.

INDIANAPOLIS, IND. — The Link Belt Co. has plans for an addition to its foundry to cost $30,000. The building will be "T" shaped, the smaller portion 106 x 140 feet, and the larger 106 x 250 feet.

INDIANAPOLIS, IND.—The Allison Experimental Co. has been incorporated with $10,000 capital to engage in experimental work on motors and racing cars by Quincy A. Muers, Edward E. Gates, and E. F. McCoy.

KOKOMO, IND.—The Indiana Railway & Light Co. will enlarge its power plant and extend its lines at a cost of $300,000. T. C. McReynolds is secretary.

MARION, IND.—A factory to cost $20,000 will be built by the Koeppen Mould Works. Plans have been completed and equipment will be purchased soon.

MUNCIE, IND. — The Whitely Malleable Castings Co. plans to build a large plant and to remodel a section of its plant which was damaged seriously by fire last fall. The new molding department will be 110 x 588 feet. The total cost of the improvements will be $300,000.

NEW ALBANY, IND.—The S. J. Gardner Foundry & Machine Co. has bought the adjoining plant and will use it as an extension.

RICHMOND, IND.—The board of public works plans improvements at the electric light plant to cost $50,000. F. Charles is city engineer.

SOUTH BEND, IND. — The Studebaker Corporation will build a forge shop 100 x 200

feet in addition to its projected foundry 140 x 450 feet.

WABASH, IND. — Wood working equipment will be needed by the Cardinal Cabinet Co., which will build a plant four stories, 80 x 90 feet.

BLOOMINGTON, ILL.—The Illinois Silo & Tractor Co. has increased its capital from $100,000 to $150,000 and will build an addition 100 x 200 feet.

BUSHNELL, ILL. — The Silo Specialty Mfg. Co., Clinton, Ia., has bought the Bushnell Tank Works and will install heavy sheet-metal working machinery, lathes, and other equipment.

CHICAGO. — S. E. Parker, 1800 North Francisco avenue, will build a foundry. W. Granger, 36 West Randolph street, is architect.

CHICAGO. — The Weller Metal Products Co. has been incorporated with $10,000 capital by B. S. Weller, J. A. Rankin and P. B. Nelson.

CHICAGO.—Bids will be received by Holabird & Roche, architects, 104 South Michigan avenue, for a 16-story building 135 x 181 feet costing $750,000 for the Chicago Telephone Co., J. S. Ford, 212 West Washington street, is engineer of buildings.

CHICAGO.—The Herbert Boiler Co., 140 Root street, M. E. Herbert, president, will build a 2-story factory and office building 51 x 106 feet to cost $15,000.

CHICAGO.—Libby, McNeill & Libby will take bids about April 1 for a 6-story lard-pail factory, 80 x 150 feet.

CHICAGO.—The Art Metal Craft Co., 1217 West Monroe street, has increased its capital from $30,000 to $60,000.

CHICAGO.—The National Lock Co., 541 West Washington street, has increased its capital from $500,000 to $1,000,000.

CHICAGO HEIGHTS, ILL.—The Calumet Steel Co., 208 South La Salle street, will build a 1-story tube-finishing plant, 75 x 150 feet.

CHICAGO.—The International Lamp Mfg. Co. has been incorporated with $10,000 capital by David Strong, B. Brown, and William Perlman.

CHICAGO.—Purchase by the Standard Oil Co., of the Karpen building, Michigan avenue, will be followed by the addition of seven stories to the twelve already built.

CHICAGO.—The H. S. Saal Co., manufacturer of hardware specialties and tools, has bought 120 x 125 feet in Ravenswood avenue, adjoining its present plant, on which a $100,000, 2-story building will be built.

CHICAGO.—The Illinois Packing Co. has bought a site 75 x 250 feet at Thirty-eighth street and Auburn avenue, on which a $150,000 plant will be built.

CHICAGO.—The Auto Truck Steel Body Co. has bought 100 x 225 feet at Carroll and Albany avenues, on which it is building a $25,000 plant.

CHICAGO. — Bids will be received until May 10, by Davidson & Weiss, architects, 53 West Jackson boulevard, on a foundry to cost $50,000. Owner's name withheld.

DIXON, ILL.—The Illinois Northern Utilities Co., E. D. Alexander, vice president, Dixon, will build a steam power plant, 75 x 100 feet, to cost $300,000.

ELGIN, ILL.—The Elgin Gas Motor Co. has been incorporated with $20,000 capital by L. B. Kilbourne, George H. Zendt, and Wm. C. Ehlerding.

JOLIET, ILL.—The Joliet Wrought Washer Co. has let contracts for a building 80 x 220 feet to replace one recently burned.

MONTGOMERY, ILL.—The Montgomery Hydro-Electric Power Co. has plans for a hydro-electric power plant, including a reinforced concrete dam and a 10,000-kilowatt generator plant. H. E. Strauss, 111 West Washington street, Chicago, is engineer.

NORTH CHICAGO, ILL.—The plant of the Republic Fence Co. has been burned with $25,000 loss.

OTTAWA, ILL.—The U. S. Silica Co. will build a silica plant and power plant to cost $75,000. The Arnold Co., 105 South La Salle street, is engineer.

ROCK ISLAND, ILL.—The Moline Plow Co. will start work soon on an addition to its Universal tractor plant, costing $45,000.

WARSAW, ILL.—The city of Warsaw is planning to build a water works system. W. L. Hill is mayor.

South of Mason-Dixon Line

WATEREE, S. C. — The Southern Power Co. has let contracts for the construction of a hydro-electric plant to cost about $5,000,000. It will develop 100,000-horsepower, and will be completed Nov. 1, 1918.

ATLANTA, GA. — Thomas F. Seitzinger Sons, smelters and refiners, plan to erect a new foundry building to cost $15,000.

CLARKSVILLE, TENN.—The Clarksville Foundry & Machine Co. has been incorporated with $10,000 capital by T. B. Foust, S. J. Lowe, H. N. Leach and others.

ROCKWOOD, TENN.—The McWane-Tennessee Cast Iron Pipe Co. is being organized here with $100,000 capital to establish a cast-iron pipe foundry by F. W. Climer, of Rockwood, and J. M. Baker, of Harriman, Tenn., and John R. McWane, Lynchburg, Va.

SWEETWATER, TENN.—Fire on March 9 damaged the plant of the Durex Chemical Co., with a loss of $75,000. The company is now constructing additions at a cost of $150,000.

PASS CHRISTIAN, MISS. — Bonds for $40,000 are to be issued for the construction of a water works plant.

LAKE CHARLES, LA.—Plans are being made for three bridges to cost $60,000.

ORANGE, TEX.—Plans are being made for the erection of a steel bridge consisting of one 120-foot span, five 18-foot spans, and one of 50 feet, with 49-foot roadway. A. L. Greenbery, Terre Haute, Ind., is engineer.

The Pacific Coast States

EVERETT, WASH.—Plans are being made by W. C. Bickford, county engineer, for a steel or concrete viaduct over the Pacific highway, costing $20,000.

SPOKANE.—Plans are being prepared by Martin MacCartney, city engineer, for a steel or concrete bridge over the Spokane river at Post street. The cost is estimated at $100,000.

ST. JOHN, WASH. — A committee has been appointed by the mayor, to investigate the advisability of building a municipal water works.

TACOMA.—The Atlas Foundry & Machinery Co. is planning to build a foundry and pattern shop, 44 x 225 feet, to cost $50,000.

TWISP, WASH.—The Mehtow Valley & Eastern railroad is planning to build a 45-mile road from Pateros to Winthrop, which will cost about $1,500,000.

BAKER, ORE. — Sumpter Valley railroad will spend about $150,000 in equipment and improvements this year.

SACRAMENTO, CAL.—The Western Pacific railroad, T. J. Wyche, chief engineer, San Francisco, will replace the wooden bridge over the American river, by a steel structure.

ST. HELENS, CAL.—C. P. McCormick & Co., Eureka, Cal., will build a machine shop at their ship building plant.

The Dominion of Canada

LONGUEIL, QUE. — The Stowell Screw Co., 70 St. Ambrois street, Montreal, will erect a $25,000 screw plant at Longueil.

AMHERSTBURG, ONT. — The Brunner Mond Co., Gordon Rutherford, manager, will be in the market for traveling cranes, quarry machinery, crushers, etc.

BRAMPTON, ONT.—The Gummed Paper Co. will build an addition to its plant and will install new machinery.

WINDSOR, ONT.—The Kelsey Wheel Co., manufacturer of automobile bodies, wheels, etc., proposes to make extensions to its plant and to install new equipment.

WINDSOR, ONT. — The Dodge Brothers Motor Co. have been incorporated to manufacture automobiles, with $100,000 capital by John F. Dodge, Horace E. Dodge, Frederick J. Haynes and others all of Detroit, Mich. The company will establish a manufacturing plant at Windsor.

WINDSOR, ONT. — The Maxwell Motor Co. has purchased a site of four acres at Windsor and proposes to erect an assembling plant at an early date.

MATSQUI, B. C.—Craig & Taylor will build a lumber mill at Matsqui, which will have a daily capacity of between 50,000 and 60,000 feet.

MOYIE, B. C.—Fire damaged the concentrating plant of Eugene mine. The loss was $300,000.

NEW WESTMINSTER, B. C.—The Timberland Lumber Co. has purchased a site at New Westminster and will erect a mill to have a daily capacity of 60,000 feet.

New Trade Publications

BRONZE ALLOYS. — A 22-page bulletin devoted to bronze alloys was recently published by the Lumen Bearing Co., Buffalo, N. Y. The booklet has been prepared to afford its users a ready reference in the purchase of casting requirements. Complete specifications such as tensile strength, hardness, specific gravity, weight per cubic inch for each of 14 bronzes are included. In the bulletin the company particularly advocates a bronze alloy claimed to have a tensile strength of 46,000 pounds, chill cast. This steel is designed to be used for high grade gears such as worm, spur, bevel, spiral and herringbone.

MELTING AND REFINING FURNACES. —The Monarch Engineering & Mfg. Co., Baltimore, has issued a 12-page booklet descriptive of its line of furnaces for melting and refining brass, copper, bronze, aluminum, nickel, ferro-alloys, iron, semi-steel, gold, silver, cyanides, ores, etc. These furnaces are designed to operate without crucibles, and with oil or gas as a fuel. The booklet contains numerous illustrations and a complete list of dimensions for each size of furnace. The booklet also contains a description of the tilting reverberatory type of furnace manufactured by this company.

SOOT BLOWERS.—A 24-page booklet devoted to soot-blowers is being distributed by the Diamond Power Specialty Co., Detroit. The booklet contains a preliminary explanation showing how many large foundries and factories attempt to effect savings in the various departments of their institutions but disregard to a considerable extent the boiler house. It is claimed that soot as an insulator is five times as effective as asbestos, and in graphic illustrations it is pointed out that a $\frac{1}{16}$-inch thickness on the boiler tubes would cause a loss of over 65 per cent on a ton of coal. Soot blowers are urged as a remedy for large coal bills.

POWER HAMMERS.—Power hammers are described in a 20-page booklet recently issued by Beaudry & Co., Inc., Boston, Mass. The ram or head of the hammer is of steel and slides in an internal elliptical shaped track. Two steel spring arms, with hardened tool steel rollers at their lower extremities, operate within the ram, upon the curved track, and serve to lift and throw the ram, which is claimed to increase the speed of the hammer, resulting in a greater force of blow. The hammer is stopped, started and regulated by a foot treadle extending around the base of the machine. The frame is cast in one piece. The anvil is an independent casting and is held in place by foundation bolts.

EVAPORATORS. — Row & Davis, Engineers, Inc., 90 West street, New York, recently issued two folders devoted respectively to evaporators and water heaters. The general design of the evaporator consists of a shell with a door to which is attached a new arc type of manifold and heating coil, the heating element being mounted on a hinged door, which enables it to be swung outside for convenient inspection, cleaning, or repair, and is claimed to eliminate any necessity for supporting rollers, tracks or any other handling device. The position of the coils forms an ebullition compartment and sets up a complete circulation without conflicting currents. A baffle in the top of the vapor space is said to eliminate all possibilities of priming.

HYDRAULIC MACHINERY. — The Hydraulic Press Mfg. Co., Mount Gilead, O., has issued an 84-page catalog devoted to hydraulic machinery. Forming presses capable of exerting pressures as high as 2,000 pounds, are illustrated in the catalog. An 800-ton forming press for cupping and drawing seamless steel casings for cylinders is shown equipped with two sets of auxiliary cylinders. One set returns the main pressure ram when the drawing or cupping operation is completed; the other set operates the blank holder which grips the steel disc as it is forced downward into the cup-forming die located in the ring holder of the lower platen. Hydraulic pumps, accumulators, intensifiers, and valves are also described.

HEAT TREATING FURNACES.—An attractive 68-page booklet devoted to oil and gas-treating furnaces and kilns has been published by the Bellevue Industrial Furnace Co., Detroit. Melting furnaces for aluminum, babbitt, barium chloride, brass and other metals are described and illustrated. Case-hardening, annealing and heat-treating furnaces of various types are also extensively shown in the catalog. These furnaces are designed for either oil or gas and are made in many shapes and sizes for practically all kinds of work. A number of pages are devoted to oil and gas burners, rotary blowers, oil pumps, thermometers, air pressure gages, pyrometers and other furnace accessories. A number of installations in the plants of prominent manufacturers are shown.

CUTTING METAL. — The Haynes-Stellite Co., Kokomo, Ind., recently issued a 24-page bulletin describing the use and application of the cutting metal known as stellite. Stellite is an alloy of cobalt, chromium and other semi-rare metals, discovered and patented by Elwood Haynes, of Kokomo, Ind. It is not a steel, however, since it contains no iron. It is claimed to resist oxidation better than any other known cutting metal, and is said to be immune to all alkaline solutions and practically so to all chemical salts. The physical test of a forged bar of stellite showed an elastic limit of 85,000 pounds, a tensile strength of 110,000 pounds and an elongation of 9 per cent. The principal claim made for stellite is its unusual hardness. Price lists, sizes and styles of cutting tools are included in the booklet.

VACUUM PUMPS.—An attractive 24-page bulletin, recently issued by the Ingersoll-Rand Co., New York, describes a complete line of single-cylinder, power driven vacuum pumps. These pumps are of the straight-line center-crank type, and are designed for power drive by belt, or for short belting to the electric motor. They are essentially self-contained and simple in construction. The driving end, completely enclosed, is lubricated by an automatic splash system. The piston rod is of the one piece type and works through a stuffing box, carried at the cylinder end of the frame in order to prevent oil from the crank basin being carried into the vacuum cylinder. The bearings which are cast integral with the main frame, supported by the walls of the frame, are lined with anti-friction metal and provided with oil grooves.

POWER HAMMERS.—A 24-page booklet describing belt driven hammers has been published by the United Hammer Co., Boston. The hammer is a one-piece casting arranged with a circular opening in the back opposite the face of the dies, enabling the long stock to be run through when desired. The hammer is operated by an adjustable crank allowing the operator to lengthen or shorten the stroke at will. Motion is applied to the hammer head by means of a connecting rod and crosshead connected to the head by means of links. A heavy spiral spring is used to obtain an elastic blow, which removes danger of breakage and also prevents undue shock to the machine. The intensity of the blow may be regulated by the treadle. Stroke adjustment can be made by means of the nut on the wrist pin and the bolt on the crosshead.

BLACK SHEETS. — An attractive bulletin describing various kinds of black sheets and special sheets was recently published by the American Sheet & Tin Plate Co., Pittsburgh. A diagram of the manufacture of steel, showing the various steps from raw ore to finished material faces the front cover. A number of pages are devoted to descriptions of standard bessemer and open hearth black sheets, automobile sheets and deep-drawing stock, stove and range sheets, electrical sheets, metallic furniture stock, jacket steel and specialty sheets. In order to facilitate ordering for customers, the booklet contains a complete table of weights of American roofing and siding, a table of United States standard gages for sheet and plate iron and steel, and a table of thicknesses of steel sheets. A table of bundling weights is presented on the two center pages.

ROLLING MILL EQUIPMENT. — The United Engineering & Foundry Co., Pittsburgh, has issued an attractive catalog recently which is called "The Rolling Mill Industry of America in Pictures". The pamphlet contains a number of interesting drawings and photographs of various rolling mills of all types. Several pages of the booklet are devoted to an illustrated description of one of the largest rail mills in the world—the one at the Gary works of the Indiana Steel Co. At this mill, the roughing train consists of four stands of two-high and one stand of three-high, 40-inch rolls. The finishing train is made up of seven stands of 28-inch rolls. Other descriptions of the company's equipment which has been installed at various mills include details of a variety of machines used in universal mills, tin-plate mills, sheet-bar mills and mills for rolling butt and lap-welded pipe.

STEEL ALLOYS.—The Pittsburgh Iron & Steel Foundries Co., Pittsburgh, has issued a 32-page booklet devoted to the description and application of a high-carbon alloy of chromium and nickel. This alloy is particularly advocated for use in rolls, gears, pinions, plungers, sand mills and other parts which are subjected to severe service. Photographs of blooming mill rolls, helical mill pinions, sizing and straightening rolls, dies for heavy service and many other products manufactured by the Pittsburgh company, all employing this alloy, are reproduced in the booklet. The bulletin also contains the United States standard gage for sheet and plate iron and steel and for wire and sheet metal gages in fractional parts of an inch. A table of Brinell hardness number and estimated tensile strength for 3,000 kilogram pressure on a 10-millimeter ball testing machine is also presented in the booklet. This same table also indicates the heats and temper colors of steel produced by heat.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

Bessemer valley	$37.50 to 38.00
Bessemer, Pittsburgh	38.45 to 38.95
Basic, Pittsburgh	33.45 to 33.95
Basic, eastern Pa.	34.00 to 35.00
Basic, Buffalo	37.50 to 40.00
Malleable, Pittsburgh	37.95 to 38.95
Malleable foundry, Chicago	37.00
Malleable foundry, Philadelphia	39.00 to 40.00
Malleable foundry, Buffalo	37.50 to 40.00
No. 1X foundry, Philadelphia	40.00 to 40.50
No. 2 foundry, Pittsburgh	37.95 to 38.95
No. 2 foundry, Cleveland	37.30 to 38.30
No. 2 foundry, Ironton	35.00 to 36.00
No. 2 foundry, Chicago	37.00
No. 2X foundry, Philadelphia	39.00 to 40.00
No. 2X foundry, N. J. tidewater	39.00 to 40.00
No. 2X foundry, Buffalo	37.50 to 40.00
No. 2 plain, Philadelphia	38.50 to 39.00
No. 2 plain, N. J. tidewater	38.50 to 39.00
No. 2 plain, Buffalo	35.00
No. 2 southern, Birmingham	30.00
No. 2 southern, Cincinnati	32.90
No. 2 southern, Chicago	31.00 to 34.00
No. 2 southern, Phila. delivery	33.00 to 34.00
No. 2 southern, Cleveland	32.00 to 34.00
No. 2 south'n, New York docks	33.25 to 34.25
No. 2 southern, Boston docks	33.00 to 34.00
No. 2 south. interior, New Eng.	34.00 to 35.00
No. 2 southern, St. Louis	30.40 to 33.40
Virginia, No. 2X furnace	34.00 to 36.00
Virginia, No. 2X, Philadelphia	36.75 to 38.75
Virginia, No. 2X, Jersey City	37.00 to 39.00
Virginia, 2X, Boston points	37.25 to 39.25
Gray forge, eastern Pa.	34.00 to 34.50
Gray forge, Pittsburgh	32.95 to 33.95
Gray forge, Birmingham	29.00
Silveries, 8 per cent, furnace	40.00 to 43.00
Silveries, 8 per cent, Chicago	42.00
Low phos. Standard, Phila.	67.00 to 70.00
Low phos. Lebanon, Pa., furnace	65.00 to 70.00
Low phos., Pittsburgh	60.00 to 61.00
Charcoal, Lake Superior, Chgo.	38.75 to 40.25
Charcoal, Buffalo	40.00 to 42.00
Charcoal, Birmingham	27.00 to 28.00

IRON ORE

Lake Superior Ores.	Lower Lake Ports.
Old range Bessemer, 55 per cent, ton	5.95
Mesabi Bessemer, 55 per cent, ton	5.70
Old range non-Bes., 51½ per cent, ton	5.20
Mesabi non-Bess., 51½ per cent, ton	5.05

Port Henry Ores. Per unit delivered eastern Pa. All non-Bessemer.

Old Bed, crude, 58 per cent	10.50c to 11.00c
Old Bed, concent., 65 per cent.	11.00c to 11.50c
Harmony concent., 63 per cent.	11.50c to 11.75c
Lump (at mines)	$5.75

COKE

(At the ovens.)

Connellsville furnace	$9.00
Connellsville fur., cont	7.00 to 7.50
Connellsville foundry, contract	7.25 to 8.00
Connellsville foundry	10.00 to 11.00
Wise county furnace, contract	7.00 to 9.00
Wise county foundry, contract	7.50 to 11.00
Pocahontas foundry, contract	7.50 to 11.00
Pocahontas furnace, contract	7.00 to 9.00
New River foundry, contract	7.50 to 11.00
New River furnace, contract	7.00 to 9.00

FERRO ALLOYS AND STEEL MAKING METALS

Ferro manganese, 80 per cent, delivered prompt	$300
Ferro manganese, 80 per cent, seaboard and deliv'd, contract.	185 to 250
Spiegel, 20 per cent furnace by July	75.00 to 80.00
Spiegel, 20 per cent, furnace, last half	60.00 to 65.00
Ferro-silicon, 50 per cent, Pbgh., nominal	175 to 225

Bessemer ferro-silicon, 9 per cent to 10 per cent, $52.00; 10 to 11 per cent, $53.00; 11 to 12 per cent, $56.00; 12 to 13 per cent, $60.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

SEMI-FINISHED MATERIAL

Open hearth billets, Phila	$65.00
Forging billets, Phila	90.00 to 100.00
Forging billets, Pbgh., nominal	90.00 to 100.00
Forging billets, Chicago	70.00
Wire rods, Pittsburgh	75.00 to 85.00
Bessemer billets, Youngstown	70.00 to 72.50
Bessemer billets, Pittsburgh	$70.00 to 72.50
Open hearth billets, Pittsburgh	70.00 to 72.50
Open hearth billets, Youngstown	70.00 to 72.50
Bess. sheet bars, Youngstown	70.00 to 72.50
Op. h'th sheet bars, Youngstown	70.00 to 72.50
Bess. sheet bars, Pittsburgh	70.00 to 72.50
Open hearth sheet bars, Pbgh.	70.00 to 72.50
Muck bars, Pittsburgh (nominal)	50.00
Grooved steel skelp	3.60c
Sheared steel skelp	4.50c

RAILS AND TRACK MATERIAL

(Gross tons.)

Stand. Bes. rails, Pbgh. & Chgo.	$38.00
Stan. op-h'th rails, Pbgh. & Chgo.	40.00
Light rails, 8 to 10 lbs., Pbgh.	53.00
Light rails, 8 lb., Chicago	55.00
Light rails, 12 to 14 lbs., Pbgh.	52.00
Light rails, 12 lbs., Chicago	54.00
Light rails, 16 to 20 lbs., Pbgh.	51.00

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Minneapolis, St. Paul	4.54
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail).	2.58
New York and Brooklyn (by canal)	1.25 to 1.60
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
Minneapolis, St. Paul	5.85
New York (all rail)	6.15
New York (r. and w.)	4.25
Philadelphia (all rail)	5.20
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago to:—	
Des Moines	$2.80
Milwaukee	.50
Minneapolis, St. Paul	2.00
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58
Minneapolis, St. Paul	4.54
Duluth, Minn., to:—	
Minneapolis-St. Paul	$1.25
Mayville, Wis:—	
Minneapolis-St. Paul	$1.75

Light rails, 16 to 20 lbs., Chgo.	53.00
Light rails, 25 to 45 lbs., Pbgh.	50.00
Light rails, 25 to 45 lbs., Chgo.	52.00
Relaying rails, standard, Pbgh. and Chicago	$33.00 to 34.00
Relaying rails light, Chicago	34.00 to 35.00
Angle bars, st. sect., Pbgh. base	2.75c to 3.25c
Angle bars st. sections, Chgo.	2.25c to 2.75c
Spikes, railroad, Pittsburgh	3.65c
Spikes, railroad, Chicago	3.60c
Track bolts, Pittsburgh	4.60c to 4.75c
Track bolts, Chicago	4.50c to 4.60c
Tie plates, Chicago	$60.00 to 65.00

SHAPES, PLATES AND BARS

Structural shapes, con. Pbgh.	3.60c
Structural shapes, Philadelphia	3.759c to 4.159c
Structural shapes, New York	3.769c to 4.169c
Structural shapes, Chicago	3.79c to 4.50c
Tank plates, Chicago	4.69c to 6.50c
Tank plates, Pittsburgh (con.)	4.50c to 4.75c
Tank plates, Pittsburgh	5.00c to 5.50c
Tank plates, Philadelphia	4.659c to 5.659c
Tank plates, New York	4.669c to 5.669c
Bars, soft steel, Chicago	3.54c to 4.00c
Bars, soft steel, con. Pbgh.	3.35c
Bars, soft steel, New York	3.519c to 3.669c
Bars, soft steel, Philadelphia	3.509c to 3.659c
Hoops, carloads, Pbgh. contr.	4.10c to 4.25c
Hoops, Pittsburgh	4.25c to 4.50c
Bands, Pittsburgh	4.10c to 4.35c
Bands, Pittsburgh (contr.)	3.35c
Shafting, Pbgh., contr. carloads	10 to 5 off
Bar iron, Chicago	3.00c
Bar iron, Philadelphia	3.659c
Bar iron, Cleveland	3.00c
Bar iron, New York	3.669c
Bar iron, Pittsburgh	3.25c to 3.50c
Hard steel bars, Chicago	3.25c
Cut nails, Pittsburgh	3.50c

SHEETS

(In cents per pound.)

(Open hearth material takes 10c above prices of bessemer.)

SHEET MILL BLACK.

Gage.	Bessemer.
17 to 21	5.05 to 5.80
22 to 24	5.10 to 5.85
25 and 26	5.15 to 5.90
27	5.20 to 5.95
28	5.25 to 6.00
29	5.30 to 6.05
30	5.40 to 6.15

TIN MILL BLACK.

Gage.	Bessemer.
15 and 16	5.05 to 5.80
17 to 21	5.10 to 5.85
22 to 24	5.15 to 5.90
25 to 27	5.20 to 5.95
28	5.25 to 6.00
29 and 30	5.30 to 6.05
30½ and 31	5.35 to 6.10

GALVANIZED.

Gage.	Bessemer.
10 and 11	5.75 to 6.50
12 to 14	5.85 to 6.60
15 and 16	6.00 to 6.75
17 to 21	6.15 to 6.90
22 to 24	6.30 to 7.05
25 and 26	6.45 to 7.20
27	6.50 to 7.35
28	6.75 to 7.50
29	6.95 to 7.70
30	7.15 to 7.90

BLUE ANNEALED.

Gage.	Bessemer.
3 to 8	4.75 to 5.25
9 to 10	4.75 to 5.25
11 to 12	4.75 to 5.25
13 and 14	4.75 to 5.25
15 and 16	4.75 to 5.25

No. 28 black, Chicago	5.19c to 5.44c
No. 28 galvanized, Chicago	6.75c to 7.50c
No. 10 blue annealed, Phila.	5.159c to 5.409c
No. 10 blue annealed, Chicago	4.94c to 5.19c

TIN PLATE

Tin plate, 100 lb., coke base, contract	7.50c to 8.50c
Tin plate, coke base, prompt	8.25c to 8.75c
Terne plate I. C.	6.00c
Terne plate, long	7.00c to 7.50c

IRON AND STEEL PIPE

(Prices adopted March 5, 1917.)

Steel.

Diameter in inches.	Black. Per cent off.	Galv. Per cent off.
⅛, ¼ and ⅜, butt	53	26½
½, butt	57	42½
¾ to 3, butt	60	46½
2, lap	53	40½
2½ to 6, lap	56	43½
7 to 12, lap	53	39½
13 and 14, lap	43½	....
15, lap	41	....

Iron.

(Prices adopted March 5, 1917.)

Standard weight, threads and couplings, diam. in inches.	Black. Per cent off.	Galv. Per cent off.
⅛ and ¼, butt	42	15
⅜, butt	43	16
½, butt	47	29
¾ to 1½, butt	50	34
1¼, lap	35	20
1½, lap	42	28
2, lap	43	29
2½ to 6, lap	45	32
7 to 12, lap	44	31

BOILER TUBES

(Price adopted Nov. 20, 1916.)

Steel, 3½ to 4½ inches, l. c. l.	46
Iron, 3½ to 4½ inches l. c. l.	36

IRON AND STEEL PRICES

Corrected up to Tuesday noon

WIRE PRODUCTS

(Adopted March 5, 1917.)
(Retailers' prices 5 cents above jobbers' quotations.)

Wire nails, jobbers', Pittsburgh	$3.20
Coated nails	3.10 to 3.15
Plain wire, jobbers', Pittsburgh	3.15
Galvanized wire, jobbers', Pbgh	3.85
Polished staples, Pbgh	3.35
Galvanized staples, Pbgh	4.05
Barb wire, painted, jobbers', Pbgh.	3.35
Barb wire, galv., jobbers', Pbgh	4.05

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled thread, 40 and 10; cut threads, 40 and 2½, larger or longer, 30 and 5.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter rolled 50; cut, 40 and 10; larger or longer, 35 and 5.

Cold pressed, semi-finished hexagon nuts, 50, 10 and 5.

Gimlet and cone point lag bolts, 50. Hot pressed square nuts, blanks, $2.50 off; tapped $2.30 off. Hot pressed hexagon nuts, blank, $2.50 off; tapped, $2.30 off.

Cold pressed square nuts, blank, $2.10 off; tapped, $1.90 off. Cold pressed hexagon nut, blank, $2.25 off; tapped, $2.00 off.

RIVETS

Structural rivets, Pbgh	4.75c
Boiler rivets, Pbgh	4.85c

Tinner's rivets, 40 and 10 off, Pittsburgh.

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	3.35c

STANDARD STEEL CHAIN

Chain, ⅜ inch proof coil	6.50c

COLD ROLLED STRIP STEEL

Base price, 7.00c to 8.00c per 100 pounds, hard, coils 1½ inches and wider and by .100 inch and heavier.

CAST IRON WATER PIPE

Four inch, Chicago	$48.50
Six-inch and larger, Chicago	45.50
Six-inch Class B, New York	42.50
Four-inch Class B, New York	45.50
Four to six-inch Birmingham	40.00
Six-inch and larger, Birmingham	37.50

Light weight water and gas pipe $1 per ton higher than standard water.

WAREHOUSE PRICES

Steel bars, Chicago	4.00c
Steel bars, Cleveland	4.35c
Steel bars, Detroit	3.75c
Steel bars, Philadelphia	4.35c
Steel bars, New York	4.35c
Steel bars, St. Louis	4.05c
Steel bars, Cincinnati	4.15c to 4.45c
Steel bars, St. Paul	4.10c
Steel bars, over 2-in., Buffalo	4.50c
Steel bars, Buffalo	4.40c
Iron bars, Chicago	4.00c
Iron bars, Cleveland	4.30c
Iron bars, Detroit	3.75c
Iron bars, St. Louis	3.75c
Iron bars, Cincinnati	4.15c to 4.45c
Iron bars, Philadelphia	4.00c to 4.25c
Iron bars, New York	4.00c to 4.25c
Shapes, Chicago	4.25c
Shapes, Detroit	4.00c
Shapes, St. Louis	4.30c
Shapes, St. Paul	4.35c
Shapes, New York	4.50c
Shapes, Cleveland	4.60c
Shapes, Philadelphia	4.50c
Shapes, Buffalo	4.60c
Shapes and plates, Cincinnati	4.40c to 5.50c
Plates, Chicago	5.50c
Plates, Detroit	4.75c
Plates, St. Louis	5.55c
Plates, St. Paul	5.60c
Plates, New York	5.50c
Plates, Cleveland	5.50c
Plates, Philadelphia	5.50c
No. 10 blue anl. sheets, Chicago	5.50c
No. 10 blue anl. sheets, Clevel'd.	5.50c
No. 10 blue anl. sheets, Buffalo.	4.50c
No. 10 blue anl. sheets, St. L.	5.55c
No. 10 blue anl. sheets, Cinci.	5.50c
No. 10 blue anl. sheets, St. Paul	5.60c
No. 10 blue anl. sheets, Detroit.	5.25c
No. 28 black sheets, Chicago	5.65c
No. 28 black sheets, Cleveland	5.75c
No. 28 black sheets, Cincinnati.	5.50c
No. 28 black sheets, Detroit	5.40c
No. 28 black sheets, St. Louis	5.70c
No. 28 black sheets, St. Paul	5.75c
No. 28 galv. sheets, Chicago	7.50c
No. 28 galv. sheets, Cleveland	7.50c
No. 28 galv. sheets, Cincinnati	7.50c
No. 28 galv. sheets, Detroit	7.50c
No. 28 galv. sheets, St. Louis	8.00c
Hoops, Cleveland	5.50c
Hoops, Detroit	4.50c

Coke Oven By-Products

Spot.

Per Gallon at Producers Plant.

Pure benzol	$0.55 to .60
Toluol	1.75 to 2.00
Solvent naphtha	.18 to .23

Per Pound at Producers Plant.

Phenol	$0.45

Per 100 Pounds at Seaboard.

Sulphate of ammonia	$4.50 to 4.75

Contract.

Per Gallon at Producers Plant.

Pure benzol	$0.55 to .60
Toluol	1.50 to 1.75
Solvent naphtha	.20 to .25

Per Pound at Producers Plant.

Phenol (nominal)	$0.45

Per 100 Pounds at Seaboard.

Sulphate of ammonia	no market

IRON AND STEEL SCRAP

(Net Tons.)

Angle bars, iron, Chicago	$28.00 to 28.50
Angle bars, steel, St. Louis	23.50 to 24.00
Arch bars and transoms, St. L.	31.00 to 32.00
Arch bars and transoms, Chgo.	28.50 to 29.00
Boiler plate, cut, No. 1, Chgo.	15.00 to 15.50
Boiler plate, cut, No. 1, St. L.	13.00 to 13.50
Boiler punchings, Chicago	20.00 to 21.00
Bundled sheet, Cincinnati	12.50 to 13.00
Busheling, No. 1, Chicago	16.50 to 17.00
Busheling, No. 1, Cincinnati	14.25 to 14.75
Busheling, No. 1, Cleveland	19.50 to 20.00
Busheling, No. 1, St. Louis	17.50 to 18.00
Busheling, No. 2, Chicago	12.25 to 12.75
Cast borings, Cincinnati	8.25 to 8.75
Cast borings, Cleveland	9.75 to 10.00
Cast borings, St. Louis	9.75 to 10.25
Cast borings, Chicago	9.25 to 9.75
Cast, No. 1, Chgo.	17.50 to 18.00
Cast, No. 1, Cincinnati	17.25 to 17.75
Cast, No. 1, Chgo.	17.50 to 18.00
Cast, No. 1, St. Louis	17.00 to 17.50

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—

New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Detroit	15.7 cents
Minneapolis and St. Paul	32.9 cents
Denver	83.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.9 cents

Cut forge, Chicago	24.50 to 25.00
Grate bars, Cleveland	14.25 to 14.50
Iron axles, St. Louis	34.50 to 35.00
Iron axles, Cleveland	43.00 to 44.00
Knuckles, coup., Chicago	24.00 to 24.50
Knuckles, coup., St. Louis	26.00 to 26.50
Locomotive tires, Chicago	34.00 to 35.00
Locomotive tires, St. Louis	33.00 to 33.50
Machine shop turnings, Chicago	8.75 to 9.25
Machine shop turn'gs, Cleveland	9.50 to 9.75
Machine shop turn'gs, Cincinnati	8.25 to 8.75
Machine shop turn'gs, St. Louis	10.00 to 10.50
Malleable agricultural, Chgo.	15.25 to 15.75
Malleable agricultural, St. Louis	16.00 to 16.50
Malleable, Cincinnati	12.75 to 13.25
Malleable railroad, Chicago	18.00 to 18.50
Malleable railroad, St. Louis	18.00 to 18.50
Pipes and flues, Cleveland	15.25 to 15.50
Pipes and flues, Chicago	14.75 to 15.25
Pipes and flues, St. Louis	16.00 to 16.50
Railroad wrought, No. 1, Cleve.	25.00 to 25.50
Railroad wrought, No. 1, Chgo.	26.00 to 26.50
Railroad wrought, No. 1, Cinci.	19.25 to 20.00
Railroad wrought, No. 1, St. L.	27.00 to 27.50
Railroad wrought, No. 2, Chgo.	25.00 to 25.50
Railroad wrought, No. 2, St. L.	26.00 to 26.50
Shafting, St. Louis	25.00 to 25.50
Springs, Chicago	25.00 to 25.50
Steel car axles, St. Louis	36.00 to 36.50
Steel car axles, Chgo.	37.50 to 38.00
Stove plate, Chicago	12.00 to 12.50
Stove plate, Cleveland	13.75 to 14.25
Stove plate, Cincinnati	10.25 to 10.75
Stove plate, St. Louis	12.50 to 13.00

(Gross Tons.)

Axle turnings, Cleveland	$16.50 to 16.75
Axle turnings, Buffalo	16.50 to 17.00
Busheling, No. 1, Buffalo	20.50 to 21.50
Busheling, No. 1, Pittsburgh	20.00
Busheling, No. 2, Buffalo	13.00 to 13.50
Bundled sheets, Pittsburgh	16.00 to 17.00
Bundled sheets, Cleveland	14.50 to 15.00
Bundled sheets, Buffalo	15.00 to 15.50
Car wheels, (iron), Pittsburgh	22.50 to 23.00
Car wheels, (steel), Pittsburgh	28.00 to 29.00
Car wheels, Chicago	21.50 to 21.75
Car wheels, eastern Pa.	23.00 to 24.00
Car wheels, Buffalo	23.00 to 23.50
Car wheels, New York	21.00 to 22.00
Car wheels, St. Louis	20.50 to 21.00
Car wheels, Birmingham	16.00 to 16.50
Car wheels, Cleveland	20.00 to 21.00
Tram car wheels, Birmingham	14.50 to 15.00
Cast borings, New York	13.50 to 14.00
Cast borings, eastern Pa.	15.50 to 16.00
Cast borings, Buffalo	12.00 to 12.50
Cast borings, Pittsburgh	14.00 to 14.75
Cast, No. 1, eastern Pa.	23.00 to 24.00
Cast, No. 1, Pittsburgh	21.50 to 23.00
Cast, No. 1, Birmingham	16.00 to 17.00
Cast, heavy, No. 1, N. J. points	20.50 to 21.00
Forge flash'gs, un. 10 in., Cleve.	20.00 to 20.50
Forge flash'gs, ov. 10 in., Cleve.	17.50 to 18.00
Forge, No. 1, eastern Pa.	16.50 to 17.00
Frogs, switches, guards, St. L.	25.50 to 26.00
Grate bars, Buffalo	15.00 to 15.50
Grate bars, N. J. points	13.50 to 14.00
Heavy melting steel, Pittsburgh	23.00 to 24.00
Heavy melting steel, Buffalo	24.00 to 24.50
Heavy melting steel, Chgo.	24.00 to 24.50
Heavy melting steel, Cleveland	23.00 to 24.00
Heavy melting steel, Cincinnati	22.00 to 23.00
Heavy melting steel, eastern Pa.	24.50 to 25.00
Heavy melting steel, New York	21.50 to 22.00
Heavy melting steel, St. L.	26.50 to 27.00
Heavy melting steel, Birmingham	16.50 to 17.00
Hydraulic pressed sheet, Cleve'd	20.00 to 20.50
Hydraulic pressed sheets, Pbgh.	20.00 to 20.50
Hydraulic pressed sheets, Chgo.	17.00 to 17.50
Iron rails, Chicago	28.50 to 29.00
Iron rails, Buffalo	25.00 to 26.00
Iron rails, Cincinnati	25.50 to 26.50
Iron rails, St. Louis	28.00 to 29.00
Iron rails, Cleveland	29.00 to 29.50
Iron axles, Pittsburgh	40.00 to 42.00
Iron axles, Cincinnati	41.50 to 42.50
Iron axles, eastern Pa.	38.00 to 40.00
Iron axles, Chicago	38.00 to 39.00
Iron axles, Buffalo	45.00
Low phos. steel, Buffalo	33.00 to 36.00
Low phos. steel, Pittsburgh	33.00 to 35.00
Low phos. steel, eastern Pa.	33.00 to 35.00
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